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GUIDE TO THE CLINICAL EXAMINATION AND TREATMENT OF SICK CHILDREN



GUIDE TO THE CLINICAL EXAMINATION AND TREATMENT OF SICK CHILDREN

BY

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WITH FIFTY-TWO ILLUSTRATIONS



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TO

DR EDUARD HENOCH

PROFESSOR OF THE DISEASES OF CHILDREN
IN BERLIN UNIVERSITY

IN TOKEN OF

ADMIRATION, GRATITUDE AND ESTEEM,

BY THE AUTHOR





PREFACE

THE scope of this book is essentially supplementary; it is intended to supply, to practitioners and senior students, practical and useful information which, taken along with that contained in a text-book on practice of medicine, will be a help to them in the study and treatment of sick children. It is meant to act as a preparation for, and introduction to, the larger, standard works on the diseases of children, and not to supersede them.

The lectures, out of which the following chapters have grown, were delivered to classes of students and graduates who were attending the clinical teaching of the Children's Hospital. The subject was therefore approached from a purely clinical standpoint, the aim being to afford such information as might render the hospital and dispensary work more interesting and instructive.

The author gratefully acknowledges the constant help and inspiration he has derived in the preparation of the original lectures, and also in writing the present book, from the text-books and other works of the late Dr Charles West, of Drs Ashby, Barlow, Cheadle, Donkin, Gee, Henoch, Jacobi, Eustace Smith, and many others. He would also record his special indebtedness to the works of recent American writers, particularly to the splendid text-books of Dr L. E. Holt and Dr T. M. Rotch.

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INTRODUCTION.

THE subject of the diseases of children is sometimes spoken of as a speciality, but if it is to be regarded as a special field in the domain of medical science at all, it is certainly one which lies beyond, and not parallel to, that occupied by ordinary clinical medicine, and it is only through the latter that it can be reached. It is much better not to begin the study of disease in children, until familiarity with its symptoms in later life has been acquired.

Infancy and childhood should then be the most interesting periods of life to the physician. It is while they last that his services are most frequently called for, and most indispensable; it is then that he can study disease in its frankest and least complicated forms; and it is then, also, that he is able most satisfactorily to control every circumstance that can act on the patient's health, and therefore ensure the best chance of recovery. It is in little children, too, that the physician's great ally, the Vis Medicatrix Naturæ, is present in fullest activity; and consequently, although the mortality is much higher in early childhood than at any other time of life, it is then also that we have by far the largest number of therapeutic successes, and are most frequently cheered by unexpected recoveries.

To the student or practitioner who has hitherto been concerned only with the examination and treatment of adults, the study of disease in childhood is indeed apt

to present great difficulties at first, but when these have been surmounted, he finds their ailments at least as easy of diagnosis and treatment, as those of his other patients.

To be successful in practice among children, certain qualifications are absolutely necessary to the physician.

Firstly, he must, of course, possess a thorough grasp of the ordinary clinical methods.

Secondly, a certain amount of tact is necessary to enable him to examine the patient without arousing active opposition. Many have this tact instinctively; some only acquire it in the requisite degree with time and experience; while to those who have no liking for children, and are out of sympathy with them, it may never come at all.

Lastly, he must make himself familiar with the chief anatomical and physiological peculiarities of childhood, so as to know what is and what is not within the normal limits; and he must have some knowledge of the nature and causes of the diseases commonest among children.

In the following pages, an attempt is made to supply this necessary information, and to indicate its relation to clinical work, in the hope of arousing some of that interest which, as Dr Moxon said, "neutralises difficulties as alkalies neutralise acids."



CHAPTER I.

SOME FACTS OF GROWTH AND DEVELOPMENT.

GROWTH IN WEIGHT.

An average-sized baby at birth weighs 7 lbs. or thereby (5 to 12). During the first two days of life there is a loss of 8 to 10 oz., due partly to the passage of urine and meconium and partly to the fact that the child does not receive enough nourishment at first to make up for the tissue-waste. On the third day a steady increase begins, the birth-weight being reached again, on an average, by the tenth day of life.

After this the rise continues more or less steadily, the infant gaining from $\frac{2}{3}$ to 1 oz. daily during the first five months, and from $\frac{1}{3}$ to $\frac{2}{3}$ oz. daily during the rest of the first year. The gain may vary considerably from day to day, but the average daily increase for the week will be at about that rate.

By the end of the fourth month the baby's weight should be nearly double what it was at birth; and, by the end of the first year, about three times its original figure. During the second year the child gains 5 to 6 lbs.; during the third, about $4\frac{1}{2}$ lbs.; and during the fourth, fifth, and sixth, about 4 lbs. a year. Thus by the end of the sixth year the weight is somewhere about six times what it was at birth, and at fourteen years double that amount.

Clinical Significance.—The advantage, from a clinical point of view, of weighing infants regularly is very great. As Dr Holt says, "The weight of the infant is the best means we have to measure its nutrition. It is as valuable as a guide to the physician in infant feeding as is the temperature in a case of continued fever."

By periodic weighing one can gauge the extent to which a particular diet is being assimilated by an infant, much more simply and surely than in any other way. Thus we may be able to detect that a change made in the food is not agreeing properly, although it has not caused any of the more obvious symptoms of dyspepsia.

For example, a delicate infant is being fed on a carefully considered diet which requires time and trouble for its preparation, and it is thriving well. For some reason, probably connected with the saving of trouble, a change is made to try whether a simpler food will not do just as well. If the new diet disagrees, it may of course give rise to obvious discomfort, or even to vomiting or diarrhœa. In many cases, however, the child seems well, and the fact that his food is not being properly assimilated shows itself only by an interference with his natural growth. He either ceases to gain as he should do, or he actually loses weight. If the baby is being regularly weighed, this loss is evident within a few days; if he is not, it may be weeks before you can be quite sure about it, and valuable time is thus lost.

If a young child is losing weight, or even not gaining it for some weeks, this is to be regarded as an important morbid symptom, and its cause must be searched for.

In older children, also, weighing may be of service, for



almost all kinds of illnesses affect the gain in weight. Thus in some institutions where children are weighed regularly as a matter of routine, it is found that the steady rise of their weight is at once checked by even slight illnesses, such as a cold or a sore throat, and much more seriously by graver disease.

Another example of the practical importance of regularly weighing children is afforded by the progress of some cases of empyema. Empyemata, in which there is a small localised collection of pus, are characteristic of childhood. These may, not infrequently, be cured by one or more aspirations. After they have been aspirated, however, it is often impossible to determine by the local physical signs whether the fluid is or is not reaccumulating. This question is usually settled if the child is periodically weighed. So long as the pus is gathering again, the child ceases to gain weight; and conversely, if there is satisfactory gain in weight we may be sure that there is no need of further tapping.

GROWTH IN LENGTH.

At birth the infant measures on an average $19\frac{1}{2}$ or 20 inches in length. During the first six months, he grows from 4 to 5 in., and in the second, 3 to 4 in. During the second year he gains 3 to 5 in.; during the third, 2 to $3\frac{1}{2}$; and during the fourth, 2 to 3. After this, the gain is rather less and amounts to $1\frac{2}{3}$ to 2 in. every year. By the end of the fifth year the child has generally doubled his original length.

Clinical Significance.—Slow growth or arrest of growth may occur without any sign of illness, and then it is usually temporary and need cause no anxiety. Generally,

however, when a child is not growing as he should, it indicates that his general nutrition is in some way at fault. Thus it may be due to improper hygienic surroundings, to chronic digestive disorder or to some other morbid condition that profoundly interferes with the general health. Rickets is a common cause of stunted growth, especially when it is severe during early infancy. All forms of severe chronic disease of the brain are apt to cause some degree of dwarfing, and we seldom meet with idiots of any kind who are not below the average stature. The disease which causes far the most complete stunting, however, is cretinism, and one of the most striking effects of thyroid treatment in it is the rapid growth which it induces.

When we compare the proportions of infants with those of older children and adults we notice that their limbs are relatively short compared with the trunk, and that the circumference of the head and abdomen are large compared to that of the thorax. These differences gradually disappear owing to the different rate of growth of those parts.

Parents not infrequently suffer from unnecessary anxiety on account of a supposed enlargement of the head or belly of perfectly healthy children, owing to their overlooking the fact that in the normal condition those parts are relatively larger in infancy than in later life.

DEVELOPMENT OF THE VARIOUS GLANDULAR ORGANS.

The Salivary Glands and the Pancreas.—In young babies the mouth is noticeably dry owing to the extreme scantiness of the saliva. Not only is the saliva very small



in amount but it is also deficient in diastatic power. At birth, ptyalin is found in the parotid secretion only, and it is not until about the eighth week that it appears in that of the sub-maxillary gland. After the third or fourth month the saliva increases in amount and functional power, but it is not until the end of the first year, when a number of teeth have usually appeared, that its amylolytic action becomes at all fully established. The action of the pancreatic secretion on starch is little, if at all, developed at birth, but by the end of the first year it is fairly established. Its proteolytic action, however, is relatively well developed in the new-born child and its action on fats is said to be active even at birth. From the slow development of the salivary and pancreatic secretions, we learn that starchy food should not be given in large quantity to young babies.

The Liver.—The liver in children is relatively large. Bile begins to be secreted early in intra-uterine life, so that, according to Zweifel, both bile-acids and bile-pigments may be detected in the bowel of a three months fœtus; and it gradually accumulates in the intestine along with the other constituents of the meconium. The bile of children differs somewhat in composition from that of adults, but the differences have at present no practical bearing.

The Stomach.—At birth the stomach is more tubular in form than afterwards, owing to the slight degree in which the fundus is developed. It also has, and retains for several weeks, the nearly vertical position which characterises it during fœtal life and its muscular wall is relatively feeble. During the first year the fundus increases in size more rapidly than the rest of the organ, and the stomach thus

comes to lie more horizontally. The small development of the fundus in young babies accounts partially for the small amount their stomachs are able to hold. According to Holt, the average capacity of the infant's stomach is, at birth, $1\frac{1}{8}$ oz.; at three months, $4\frac{1}{2}$ oz.; at six months, 6 oz., and at twelve months, 9 oz.

An infant's stomach does not play such an important part in the process of *digestion* as that of the adult. This is apparently because the gastric juice in the former is scantier and less powerful and also because the stomach contents are not allowed to remain long enough in it to be completely digested. When a meal of breast-milk is taken into the stomach, the curd of it is usually coagulated within 10 to 15 minutes by the action of the rennet-ferment. This is then acted on by the acid and pepsin of the gastric juice in the usual way; but before its digestion is nearly completed, a large proportion of the meal has passed on into the bowel to be further dealt with there. Holt says that in young infants a considerable part of the milk passes into the intestine during the first half hour, and that, by the end of an hour, the stomach is often empty. The duration of the gastric digestion varies with the infant's age and with the nature of his food. Thus, while the stomach is empty 1 to $1\frac{1}{2}$ hours after feeding in breast-fed babies of a month old, in those of two to eight months the average time is 2 hours. In the case of children fed on cows' milk the time is about half an hour longer.

The *gastric juice* contains pepsin, hydrochloric acid, and sometimes lactic acid as in adults; but it is relatively less in amount, and contains free hydrochloric acid in much smaller proportions. The small proportion of free acid is



practically important, not only because of its bearing on the rapidity of digestion, but because it accounts for the fact that the gastric juice in young infants has less germicide power. This probably explains to a large degree their characteristic susceptibility to gastro-intestinal infection. The mucous glands of the stomach are more numerous and the secretion of mucus more copious in the infant than in the adult.

The Intestine.—In young children the intestine differs in several respects from that of the adult. Its length, for example, is relatively greater, and its muscular wall is comparatively feebly developed. This latter fact helps to account for the greater tendency to constipation in young children, and for the flatulent distention of the abdomen which is so common in early life.

At birth the cæcum is situated relatively high up, and it is more movable than in adult life (Dwight); the ascending colon is short. The large size of the sigmoid flexure is a striking feature in the new-born child: at birth it is nearly as long as the rest of the large intestine; but by the fourth month the other parts of the colon have grown so much that the sigmoid has nearly assumed its permanent proportion to them (Rotch).

In the small intestines the food is further acted upon by the pancreatic juice and other secretions; and not only are water, salts, sugars, and peptones absorbed as in the stomach, but the fat of the food is emulsified and taken up. In the large bowel there is absorption, but little or no digestion of food.

The Thymus.—The thymus gland must be remembered in examining the thorax in babies. It is a comparatively

large organ at birth, weighing usually about ½ an ounce; and it grows in size until it reaches its full development about the end of the second year, when it weighs from 1½ to 2 oz.; after that time it gradually diminishes. Its exact size, and the rate at which it diminishes, vary greatly in different cases. It occupies in most instances a considerable proportion of the upper part of the thorax, and gives rise to a large area of dulness over the upper part of the sternum.

Hypertrophy of the thymus and consequent interference with the respiration is usually regarded as a possible cause of sudden death in young infants. The conditions under which this occurs, and the degree of hypertrophy which is dangerous, is, however, a question which is involved in considerable obscurity. Other morbid conditions of the thymus are fortunately rare, and of little clinical importance.

The Lachrymal Glands.—An infant usually begins to shed tears when he is three or four months old, but sometimes this happens earlier. Rotch has observed it in a baby of a month old. When a child is very ill, tears cease to be shed, and their re-appearance is a very favourable sign and indicates the approach of convalescence.

The Sweat Glands.—Infants do not usually perspire at all during the first week of life, but there are exceptions to this rule. Copious perspiration in young children, apart from overheating, is unnatural, and is almost invariably a sign of rickets. Sweating is a less frequent accompaniment of pyrexia in children than in adults.

The Sebaceous Glands.—The sebaceous glands are well developed and active long before birth, as is evidenced by



the amount of vernix caseosa which they produce in intra-uterine life. During early infancy a condition of seborrhœa capitis is often met with. The excessive secretion, mixed with the dirt which it gathers, gives rise to brownish yellow, closely adherent scales, which cover the vertex of the scalp especially over and near the anterior fontanelle. Ignorant mothers are apt to allow this material to accumulate, under the impression that it affords a sort of protection to the "opening of the head," and that its removal might result in a cold. The accumulated secretion under these circumstances often sets up irritation and ends in eczema. The crusts should be at once removed with soap and water after being soaked with olive oil.

The Testicles.—Normally the testicles pass down the inguinal canal during the ninth month of intra-uterine life. Not uncommonly, however, we meet with children in whom this process has been delayed and at birth one or both sides of the scrotum are empty. The delayed organ may appear during the first month without treatment, or may be indefinitely delayed and require the attention of a surgeon. If it is delayed beyond the first year it is usually accompanied by a hernia when it does appear.

The Mammæ.—All new-born babies, boys as well as girls, have a secretion of milk in their breasts—"Witch's Milk" the Germans call it. The fluid secreted resembles adult milk in composition and under the microscope looks like colostrum. The secretion begins in intra-uterine life; but swelling of the mammæ is usually only noticed some days after birth. It increases until about the ninth day, and then slowly diminishes. About twenty days after birth it has in most cases entirely disappeared. Occasionally it lasts for

several weeks and I have once seen greatly enlarged and secreting mammæ in a child of four months.

The swollen breasts should be carefully protected against injury and kept scrupulously clean. Occasionally an abscess forms in one or both of them through the entrance of pyogenic organisms (Fig. 1). When this occurs there is sometimes, although not often, a history of the part having been squeezed by the nurse. These abscesses should be opened in the usual way and they generally heal rapidly. If, however, the child is sickly, serious sloughing may occur.



FIG. 1.—Mammary Abscess. Baby aged 6 Weeks.

Girls who are approaching puberty — between 10 and 15 years old—occasionally suffer from a condition known as "irritable breast." One of the mammæ enlarges and becomes tender to touch for a while; and, after an interval, the other is often similarly affected. The condition is probably connected with the development of the organs. It is harmless and requires no special treatment.

DEVELOPMENT OF THE SENSORY FUNCTIONS AND THEIR TESTING FOR CLINICAL PURPOSES.[1]

Sight.—Very soon after birth a baby is able to distinguish light from darkness, but it is a long time before his eyes

[1] The development of the mental functions in the child—including those of speech and of the organs of special sense—has in recent years



afford him much information. After the first few weeks most infants manifest distinct signs of pleasure when they are shown a shining object or a bright light, and a restless baby may often be quieted for examination by being carried to a window. By the third month a normal child should shew that he recognises his mother's face. By the sixth, he will recognise many things; but for some time after he seems to know what they are, he will be unable to estimate their distance from him and will grasp at them when they are quite beyond his reach.

Bright colours please even infants of a few weeks old, but the power to discriminate between colours is comparatively long of developing. Red and yellow may be recognised in the first twelve months, but blue and green not usually until the second or third year.

In older children we *test the eyesight* by the same methods as are used in examining adults. In infants and young children a thorough examination is of course impossible but, with care, the main facts required can often be ascertained. To measure a baby's power of seeing, the most familiar sights should be used. Thus, it may be observed at what distance he responds to his mother's smile or recognises an approaching bottle at meal times; and, when he is older, the identification of such familiar

formed the subject of a large amount of literature. The student will find much interesting information and many references to special papers in the following works: *The Three First Years of Childhood*, by B. Perez, transl. London 1885; *The Senses and the Will*, and *The Development of the Intellect*, by W. Preyer, transl. Intern. Educ. Series, New York 1888 and 1889; *The Psychology of Childhood*, by Fred. Tracy, 3rd. Edit. Boston, U. S. A. 1895; and in such publications as the *Transactions of the Illinois Society for Child Study*, Werner Co. Chicago 1894-5.

and welcome objects as a penny or an orange forms a suitable test of vision.

It should also be noticed if the pupils contract with light, and, if the child is more than a few months old, with accommodation. It is sometimes useful to test the vision by bringing the point of the finger suddenly close to the cornea without touching it, and observing whether winking is produced. In babies under two months, however, this manœuvre does not cause winking. Children who are far too young to be able to read or name letters, will often prove the acuteness of their vision for near objects, by recognising at once, and discriminating between little figures of men and women, or horses and dogs, such as are commonly seen in the small landscape wood-cuts which accompany many advertisements. Apparent blindness along with a normal fundus and media is characteristic of idiocy.

Photophobia is sometimes met with as a symptom of a general morbid condition. It is common during the onset of measles and influenza, and it is also one of the early symptoms of tubercular meningitis and cerebral hyperæmia. It is of course often due to local disease of the eye, and may in rare cases be caused by peripheral irritation from the teeth.

In using the *ophthalmoscope* to examine children's eyes, the indirect method is the more useful. It may be necessary to separate the eyelids gently with the finger and thumb to get a good view through the pupil, but the less the child is touched during the examination, the less likely is he to resent it. If the baby is asleep, the examination should be attempted before he awakes, as the light



may not rouse him; and if it does not, there is a better chance of seeing the disc than there will be after he awakes. Remember that the distribution of the choroid pigment is often irregular in infancy, and physiological peculiarities in this matter are apt to be mistaken for the results of disease.

As Dr Maddox has pointed out to me, the images produced by the *reflection of light on each cornea* are helpful in the examination of children's eyes in two ways. In the first place by noticing the exact position of the image when the disc is in sight, we may be greatly helped in finding it again without losing unnecessary time. Again, the comparison of the position of the corneal images in the two eyes may lead to the detection of a squint.

Hearing. — During the first day or two of life all children are deaf; but by the second week, if not earlier, they should be able to hear loud noises quite well. If a child pays no attention to a loud sound behind him, by the fourth week, he is probably either deaf or idiotic. By about the end of the third month, the child will usually recognise the direction of a noise, and turn towards it. It is much longer, however, before children can distinguish between different sounds. Thus, among one hundred normal children, Demme found only two who seemed to recognise their mother's voice by three and a half months. Often they are much later in doing so. By six months most babies like being sung to, and small infants generally seem pleased by jingling and rattling noises.

If an infant on the bottle, who seems in good health, shows no interest when the sound of the usual preparations

for a meal are being made, although he cannot see them, it is probable that either his hearing or his intellect is at fault. In examining infants' ears, remember the shortness of the external meatus, which is such that a speculum is often scarcely necessary; and also the extreme obliquity of the tympanic membrane.

Both Taste and Smell are relatively well developed within the first few days of life. They do not, however, acquire a great degree of acuteness until later childhood. It is seldom necessary to test them in children for clinical purposes. When it is, familiar articles of food generally form the best tests.

The **Sensibility** of the new-born child to **Touch, Temperature** and **Pain** is not very acute. The testing of these sensations in young children demands infinite tact and patience and often leads to little result. It is always well, if possible, to repeat the observations several times, on separate occasions, before being sure of their accuracy.

DEVELOPMENT OF THE VOLUNTARY MOTOR FUNCTIONS.

The young infant has a fair amount of muscular force at his disposal, but it takes him a good while before he knows how to use it. At birth he can breathe and cry, he can suck and swallow, his bladder and bowel empty themselves and his heart beats. He can also move his body, head and limbs about aimlessly, and he can cling with wonderful tenacity to an object put within his grasp. All these movements, however, are automatic and it is only after



some three or four months have passed that he acquires the power to execute distinctly voluntary movements, such as turning towards those he is fond of, or pushing away from him something which he does not like.

One stage in his muscular development is marked by his acquiring the power *to hold his head straight up*,—his body of course being supported. A new-born chicken that has just come out of the shell cannot hold up its head at first. Within a few hours, however, it has gained control over it and goes about picking quite cleverly. A baby, on the other hand, is unable usually to hold his head erect until he is three or four months old, according to the degree of his muscular development.

If a finger is laid in an infant's palm it is generally tightly *grasped*, and if the child is over five months old it will probably also be carried towards his mouth. Should the child's fingers show no inclination to close on an object placed in his palm, it is a morbid sign, suggesting usually either paralysis or great mental impairment.

The power *to sit up* appears at a time which varies with the vigour of the individual baby. A child, however, cannot generally sit, even for a short time, until he is six or eight months old, and then only if carefully propped up. Not until he is eleven or twelve months old does he permanently acquire the capacity for sitting unsupported.

Some children *creep* before they walk—as early perhaps, as the ninth month—with others, creeping is a later accomplishment. A strong baby generally begins to try *to stand* by the ninth or tenth month, and may be able to do so for a little by the eleventh or twelfth. The exact time by which a child *walks alone*, varies considerably in different instances,

fourteen or fifteen months is perhaps the average age. Some are able to do so at one year, and some not till seventeen or eighteen months. It is well to remember Dr Gee's axiom that a child "who is not idiotic or weakened by some recent acute disease, and who cannot walk at eighteen months of age, is either rickety or paralysed."[1]

Backwardness in holding up the head and in other muscular movements has a similar significance to delay in the power of walking. A healthy child takes the keenest delight in the free exercise of his muscles, and any habitual disinclination to move is a morbid sign. If a young baby is swayed up and down in his nurse's arms, he shews evident signs of pleasure and his limbs move in time with her movements. If this does not occur and her movements arouse no answering efforts on his part, there is reason to suspect the presence of idiocy of an extreme degree.

SLEEP.

Normal Sleep.—During the early weeks of life the infant should sleep nearly all the time that he is not being fed or washed or having his clothes changed—perhaps 20 hours or more out of the 24. As he grows older, his need for sleep becomes gradually less, but by the end of the first year he should still be allowed from 14 to 16 hours, and during the second and third year from 12 to 14 hours in the day. One or two of these hours are to be taken in the afternoon and the rest at night. From four to five, he should have 10 or 12 hours sleep, all at night; from six to ten years, 10 or 11 hours; and from twelve to sixteen,

[1] On Rickets, *St Bart. Hosp. Rep.* Vol. iv. 1868, p. 72.

9 hours sleep should be considered the minimum desirable. The more sleep nervous children can be induced to take, at all periods of their lives, the better it is for them—the more likely are they to grow out of their nervousness and the less likely are they to break down.

Young infants, after the first month or two of life, are easily disturbed, but after three or four years the child sleeps the enviably sound sleep which is so characteristic of healthy childhood, and is difficult to waken. The exact amount of sleep required differs to some extent in different children. As a rule we may say that the more a child sleeps, the better it is for his health, and if a baby is sleepless to any extent it is a cause for anxiety.

The *attitude* the child assumes during sleep is worthy of notice. A healthy infant generally lies on his side, or rather with his body semi-prone or prone, and his head turned face downwards on the pillow (Dr Louis Robinson). His limbs are often fully flexed so that the knees tend to touch the abdomen and his hands are held close up to his chin (Fig. 2). As Prof. Henoch points out, this attitude may perhaps be regarded as reminiscent of intra-uterine life. It is apt to be altered in disease, and therefore its presence in any case may be regarded as a reassuring sign.



FIG. 2. — Atrophied Infant, aged 7 weeks.—Natural Attitude of Upper Limbs during Sleep, and Imperfect Closure of Eyelids.

The eyes should be closed in healthy sleep. In severe acute illness with collapse and rapid emaciation, the eyes of

the sleeping child are often partially open. This is seen also in atrophy (Fig. 2) and extreme debility from any cause, owing probably to the lack of tone in the orbicularis muscle. Incomplete closure of the eyes during sleep, however, is not necessarily a serious symptom, for this condition is frequently seen, after an evening party, in nervous irritable children, such as grind their teeth and have night-screaming attacks, and in them it merely indicates that they have had an indigestible meal or an undue amount of mental excitement.

The mouth also should be closed; and, if it is open and the child breathes through it while he is otherwise healthy, this usually indicates the presence of enlarged tonsils or of adenoid growths in the naso-pharynx. When this condition commences suddenly, it indicates rapid swelling at the back of the throat, such as occurs in diphtheria or scarlet fever.

Abnormal Sleep. — Sleep may either be deficient in amount or it may be disturbed and lacking in that peacefulness which is its characteristic in health; or night-mare or night-terrors may occur.

In infants, disturbed and interrupted sleep is mainly due to insufficient food or to indigestion, and its presence is always an indication that the diet needs careful looking into. It is also, however, often present in other diseases. Thus it is characteristic of rickets, of eczema and other affections accompanied by itching, and of otitis, difficult dentition, and other painful conditions. Sleeplessness, again, is a symptom in septicæmia, pneumonia and other feverish illnesses, and is also very characteristic of the early stages of congenital syphilis. So much is this the case that I have



more than once heard the mothers of syphilitic children refer to the grey powder they were taking as "those sleeping powders."

In older children, sleep is often disturbed as a result of indigestion and late meals, and of various local causes of discomfort such as adenoids and cold feet. Difficulty in falling asleep at night is also often a sign that the school work is too much for the child's strength; and again, it is sometimes caused in nervous children by an undue amount of mental exertion or emotional excitement shortly before going to bed.

Sleeplessness and restlessness occurring as a symptom of acute disease in strong children are usually best treated by appropriate doses of antipyrin or phenacetin. When they occur habitually, however, the only rational treatment is that directed against their cause, and regular dosing with hypnotics is to be regarded as both hurtful and ineffectual.

Night-Mare and Night-Terrors.—(*Pavor Nocturnus.*) These two conditions are not uncommonly met with in children between two and eight years old. As Coutts has pointed out,[1] they are often confused with one another. In night-mare, the child wakes suddenly without apparent cause from a sleep which has usually been somewhat disturbed and screams out, owing to having had a bad dream. In night-terrors proper, on the other hand, the sleep from which the patient awakes has usually been peaceful and his screams are due to his having "seen visions" rather than "dreamed dreams." Thus he cries out that a big dog or black man is threatening him, or he may mistake his mother,

[1] *Amer. Journ. of Med. Sci.*, February, 1896.

standing at his bedside, for a horse about to run over him.

Night-mare, if adenoids are present, is often permanently cured by their removal. In many cases, whether adenoids are there or not, attention to the diet will speedily remove the nervous symptoms. Regular night-terrors can generally be temporarily stopped by a sufficient dose of antipyrin or some other sedative given at bedtime. It is important, however, to remember that the occurrence of such attacks indicates a condition of the nervous system which urgently demands an investigation of, and probably a change in, the child's habits and surroundings as to diet, education and hygiene.

Somnambulism.—Somnambulism does not usually occur in children under ten, and is met with mostly between that age and adolescence. Its significance is the same as that of night-terrors.

Delirium is common in childhood in all conditions accompanied by fever and it may be recognised even in young babies by watching their gestures and expression (Fig. 9). It is noteworthy that very different degrees of temperature give rise to this condition in different children. Thus, some become delirious if their temperature rises at night to 101° or even to 100°, while others can stand a temperature of 105° or more without getting light-headed, and many are not so at 103° or 104°. Proneness to delirium at comparatively low temperatures is probably, as Dr Clouston points out,[1] an indication of a very unstable nervous system.

[1] *The Neuroses of Development*, Edin. 1891, p. 12.



SPEECH [1]

Development of Speech.—A baby's first cries, like his first movements, are instinctive, and have no intentional meaning. Soon, however, he finds that his cry results in his being fed or otherwise attended to, and so he learns to cry when he wants anything. Later he gets to know that certain words or syllables mean certain things, and that by using them he gets what he wants sooner than by indiscriminate crying.

By the time he is twelve months old, he will know the meaning of a good many words, and there will be one or two articulate sounds which he habitually uses with a definite meaning. During the second year his knowledge of words increases fast, and he begins to use short phrases before the end of it. The date at which different children begin to talk varies, however, greatly, and often it is impossible to tell why it does so.

During the time that they are learning to speak, normal children almost always make use of some words of their own invention, but as their powers of talking develop, these baby-words are forgotten. Similar words are often invented by imbeciles, but in them they continue to be used during life.

Backwardness in learning to speak is a thing which naturally causes anxiety to parents. It may be explained in a number of ways:

(1). It is often attributed to *tongue-tie*. This is a mistake, for while the condition may interfere slightly with sucking,

[1] For the best account of speech, normal and abnormal, the reader is referred to Dr John Wyllie's book on *The Disorders of Speech*.

and possibly, as the child gets older, with the pronunciation of certain letters, it never delays speech.

(2). In some cases it is a symptom of *idiocy*.

(3). Not uncommonly, slowness in acquiring speech is due to *defective hearing*. This cause is apt to be overlooked, owing to the child responding at once to loud noises, although he is sufficiently deaf to have a difficulty in noticing and imitating the lesser variations of sound which make up ordinary speech.

(4). More commonly, delay in speaking is due to *general backwardness in development* following severe illness, or accompanying some such weakening condition as rickets, and words come as the child gets older and stronger.

(5). There are many cases, however, of children slow of speaking, who have normal intelligence and good hearing and who have not been recently ill. It is often impossible to tell why they do not talk soon. The main practical point is that in such cases the prognosis is generally good; and that slowness in beginning to speak is not in itself a proof of defective intelligence. Instances of intelligent children who remain dumb, without being deaf, are almost entirely confined to story books.

Aphasia may occur in children as in adults, as the result of organic brain disease, or it may be purely functional. In the former case, it is generally, although not always, caused by disease of the left hemisphere. In the latter, it is most frequently seen during recovery from one of the infectious diseases, such as enteric fever, whooping-cough, or measles, or in connection with an attack of chorea. Rarely, as in a case reported by



Dr R. A. Lundie,[1] it sets in apart from any other morbid condition.

Nasal Speech, when it is habitual, is generally the result of enlarged tonsils or adenoids. When it sets in suddenly, it may be due to swelling of the parts at the back of the throat, or to paralysis of the soft palate.

Stammering is sometimes met with as early as two years old in neurotic children. In these cases it is generally temporary; persistent stammering rarely begins before the commencement of the second dentition, and is commoner in boys than in girls.

When young children stammer, little or nothing can be done in the way of direct treatment. Attention should, however, be given to the general health, all sources of nervous excitement and irritation avoided, and singing encouraged as much as possible.

In older children much improvement follows careful training. The child must attend to the way in which he speaks, and the mechanism of speech must be explained to him so far as he is capable of understanding it. He must be taught to speak *with voice*, that is to say with a certain musical resonance: he must also take breath frequently while speaking, so as never to speak from an empty chest. If capable of singing he should exercise his voice in this way regularly, and he should practice for 15 minutes at least every day, reading special sentences which contain the sounds he has difficulty with, frequently repeated, as well as ordinary poetry and prose. The child's general health must also be attended to, and special care taken that he is not being overworked at school.

[1] *Edin. Hosp. Rep.* Vol. IV., 1896.

Lalling is the name given to a form of broken and defective baby-speech, which, although natural in infants who are beginning to learn to talk, is morbid when it persists, as it occasionally does, in later childhood.

Its treatment consists in training the child in articulation, as deaf-mutes are trained, by the oral method. The child is placed before the teacher who demonstrates to him by exaggerated movements of his own lips, tongue and larynx the way in which the desired sounds are produced. The child is also made to practise regularly simple exercises which contain the sounds which he has most difficulty in pronouncing.



CHAPTER II.

ON THE TEETH.

DENTITION.

A. The Temporary Teeth.—The temporary or milk teeth are 20 in number. The following table gives the usual average ages at which they appear (Holt).

(1) Lower central incisors, . .	6 to 9 months.
(2) Upper central and upper lateral incisors, ...	8 to 12 ,,
(3) Lower lateral incisors, and lower and upper first molars, .	12 to 15 ,,
(4) Lower and upper canines, .	18 to 24 ,,
(5) Lower and upper second molars,	24 to 30 ,,

In normal children the teeth usually come in pairs—a tooth on one side cutting the gum about the same time as the corresponding one on the other side. Those in the lower jaw appear a little earlier than the corresponding ones above, except in the case of the lateral incisors. The order in which the teeth make their appearance in healthy infants seldom varies, but while the average dates of appearance are as stated above, the intervals between the cutting of the different groups of teeth may vary considerably.

Irregularity in their order, and the appearance of teeth singly, instead of in pairs, is an indication of rickets.

Sometimes dentition commences unusually early, and it is not uncommon to meet with children whose first teeth have appeared by the time they are three or four months old. In rare cases infants are born with teeth (usually lower central incisors).

Delayed dentition is also common. Sometimes it occurs with apparently perfect health—the first incisors not showing till the child is ten, twelve or even in rare cases fourteen months old. Generally, however, any marked retardation of dentition is attributable to disease and in the large majority of instances to rickets. If a child has no teeth at ten months he should always be examined for other signs of this disease.

It is better on the whole that the teeth should not appear through the gums too soon, as when they do so they are apt to have thin enamel and not to last so long as they might have done had their crowns had longer time to mature under the gum.

Symptoms of Teething.—In many cases nothing unusual is noticed in the general condition of the child while the teeth are making their way through the gum and there is little local disturbance. It is, however, a matter of common observation that many babies are more or less out of sorts for a short time before a coming tooth appears and are greatly relieved when the process is completed. The disturbance may be local or general, or both.

Local pain in the jaw is often evident. A teething baby keeps his lips compressed and resents any attempt to look at his gums. He often puts his fingers into his mouth as if it was uneasy, or he may screw up his face or put his hand up to his ear as if visited by a sudden twinge of pain. A



closer examination shows that the saliva is greatly increased in amount and that the gum over the coming tooth and in its neighbourhood is bright red, swollen and tender.

The child is often flushed and feverish whether the local disturbance is noticeable or not, and there may be restlessness, loss of sleep and irritability. The appetite may also be lost for the time, and the bowels may become constipated or there may be slight diarrhœa. Often the child loses weight or ceases to gain it. Less frequently, slight temporary neuroses develop *e.g.*, there may be a tendency to winking the eyes or a frequently recurring cough or a marked acceleration of breathing without any pulmonary disease.

Some children have, while teething, a tendency to certain diseases to which they are not subject in the same degree at other times. Thus it is not an uncommon thing to find a child who, with the appearance of each new group of teeth, has an attack of diarrhœa or vomiting, or bronchitis, which resists treatment stubbornly while the teeth are in process of appearing, but which rapidly recovers (under otherwise similar conditions) when they are through. Similarly, we see infants with eczema who have a marked relapse with each new group of teeth; and often an obstinate eruption will disappear almost spontaneously whenever all the teeth have pierced the gum.

The Place of Dentition as a Factor in the Causation of Disease.—This is a point on which there has been great difference of opinion. It used to be thought that teething was a frequent cause of serious and fatal disease. Parents, especially the uneducated among them, are always ready to blame teething for all sorts of grave diseases. This is

a dangerous belief, because there is usually associated with it the idea that, as teething is a natural process, the diseases due to it are therefore to be tolerated and not checked as they would be under other circumstances. Consequently, we often meet with children exhausted with diarrhœa which has been allowed to go on untreated for weeks because it was held to be "only from the teeth." The diagnosis of teething as the cause of any illness will always be a popular one, because it casts no blame on the parents, as exposure to cold, improper feeding and rickets are apt to do.

In recent years a number of medical men, in Germany and America chiefly, have gone to the opposite extreme. They say that dentition is a physiological process and therefore does not cause disease—that "teething produces teeth and nothing else."

We shall be nearer the truth if we avoid both extremes. There can be no doubt that teething is not in itself a cause of death and that its influence in producing and predisposing to disease has been enormously exaggerated. At the same time it is equally certain that teething like menstruation, pregnancy and other natural states is often accompanied by marked symptoms both local and reflex, and like them may produce temporarily a tendency to disease which is not present at other times.

The effect of teething on a child's health varies with his strength and especially with the state of his nervous system. While most children, fortunately, cut their teeth without anything but a slight passing indisposition, if even that, others who are rickety, neurotic or otherwise weakly may show signs of more or less severe reflex as well as local irritation. The symptoms which arise in this way may be alarming,



not because they are themselves such as to threaten life but because they often lead us to suspect the presence of some serious disease. When we remember the amount of general disturbance of health and comfort which may occur in children at an older and less sensitive age from phimosis or adenoids or the presence of worms or scybala in the bowel, we can scarcely wonder that alarming symptoms are occasionally set up in babies by the irritation that accompanies dentition.

Diagnosis.—It is easy to ascertain whether teething is proceeding or not, but very difficult sometimes to make sure of the part, if any, which it plays in producing such symptoms as are present. For example, a case of simple bronchitis may be mistaken for one of pneumonia on account of a high temperature and rapidity of breathing which are attributable to dentition. In such a case a careful consideration of the physical signs and the absence of real dyspnoea or distress will help to decide the diagnosis. Again, children who are suffering from dyspepsia and teething at the same time may be drowsy, irritable and feverish. They may even have head-retraction and often vomiting, so that a mistaken diagnosis of commencing meningitis is possible. The absence of a slow irregular pulse, or of cerebral breathing, of obstinate constipation, or of a retracted abdomen, would be in favour of the less serious condition, and would incline us to suspend our judgment until further symptoms appeared. A knowledge of the physiognomy of cerebral disease would be of practical value; and the administration of a dose of an aperient might remove diagnostic difficulties to a surprising degree.

The diagnosis of teething as a cause of morbid phenomena in infants (like that of hysteria in older patients) should never be made until all other causes have been most carefully excluded, and, as Dr. Donkin says, we should never be satisfied with it until the child is well.

Treatment.—The restlessness, wakefulness and irritability of teething children is often greatly relieved by the occasional administration of a sedative. For this purpose, antipyrin in doses of one or two grains is very useful. Phenacetin (gr. i.) or bromide of potash or soda (grs. ii. to iv.) may also be given. Preparations of opium, including the so-called "Soothing Syrups" should never be used for this purpose. As already mentioned, an aperient such as castor oil frequently produces a marked improvement in the symptoms. Diseases which occur during dentition should be treated as at other times, and the fact that teething is proceeding affords no reason why treatment should be delayed or considered unnecessary.

Lancing the gums was at one time considered desirable in all cases of obscure illness occurring in children at the age of dentition. It is now known that such a practice is not only unnecessary but possibly hurtful in all but a few exceptional cases. When serious disease is present it is extremely doubtful whether lancing the gums can ever favourably modify its course. If, however, the gum is swollen, red and tense over a coming tooth and the child is suffering local pain or showing signs of reflex nervous disturbance, there can be no doubt that judicious lancing of the inflamed gum may afford immediate relief, and it can do no harm.

B. **The Permanent Teeth.**—The permanent teeth



number 32. The order and usual time of their appearance are as follows (Forchheimer):—

First molars	6 years.
Incisors	7 to 8 years.
Bicuspids	9 to 10 years.
Canines	12 to 14 years.
Second molars	12 to 15 years.
Third molars (wisdom teeth) .	17 to 25 years.

The first molars appear behind the second temporary molars, while the permanent incisors, canines, and bicuspids take the places of the temporary incisors, canines and molars. The eruption of the permanent teeth is not a usual source of irritation either local or general in childhood; but the wisdom teeth, especially those of the lower jaw, may cause some distress when they appear.

CARIES OF THE TEETH.

Caries of the teeth is an important disease from the physician's point of view as well as from that of the dentist. Some seem to think that it is a natural and not altogether objectionable thing for the milk teeth to become carious before they drop out to make room for their successors. This is a great mistake. The crowns of the milk teeth should remain quite clean and white and whole until, their roots having been absorbed owing to the pressure upwards of the permanent teeth, they drop out of the mouth.

When the temporary teeth become carious, any cavities which form in them should be dealt with by the dentist as soon as possible. If this is not done the progress of the disease will probably lead not only, sooner or later, to

toothache, but will interfere with mastication and, consequently, with the amount of food taken and with its digestion. We must also remember that decaying milk teeth constitute a dangerous source of infection of the permanent ones. On the other hand the unnecessary extraction of milk teeth is much to be deprecated, as it is likely to lead to interference with the proper growth of the jaw and the position of their successors.

Dental caries is due to the action of micro-organisms. The fluids of the mouth in health contain a large number of species, and some of these are capable of setting up disease in a tooth if they can gain access to its interior, but if the coating of enamel which covers the crown of the tooth remains intact they are unable to do so. There are, however, among them several species capable of changing starchy and saccharine matters into lactic acid. When therefore food is allowed to accumulate and decompose in the interstices of the teeth, sufficient acid is formed by them to neutralize the saliva, the lime salts of the enamel are dissolved and an entrance is given to the micro-organisms which eventually destroy the tooth.

Care of the Teeth.—As decay of the teeth may be so detrimental to a child's health, regular cleaning of them is important. If they could be kept quite clean there would be no decay. It is also good for the health of the teeth that they should be freely used. Savages are said always to have good teeth although they never clean them except in nature's way, which is to use them freely in biting hard and tough things. Young children have usually a great liking for chewing things, and it is good for them to try their jaws now and then on hard biscuits or other kinds of



hard and tough food of a wholesome nature. Well meaning parents may injure their children's teeth by allowing them to have nothing to eat that is not quite soft.

The systematic cleaning of the teeth should be begun early, especially in delicate infants. Children can soon be taught to brush their own teeth, but at first the nurse should be instructed to remove, with a soft cloth or brush, any fragments of food that tend to accumulate. Dentists tell us that to keep the teeth thoroughly clean we should use a toothpick, a waxed thread and a tooth brush with powder. The regular daily use of a tooth brush, however, will probably be found to be sufficient.

The tooth brush should be used night and morning. It should not be too hard and its bristles should be of unequal lengths. Some simple alkaline tooth powder which is not gritty should be used, and one which is cheap is to be preferred as it should be used very freely (F. 1 and 2). Tooth powder is generally cheap if bought by the pound, but very dear if procured in small quantities.

There are certain medicines the taking of which is bad for the teeth—chiefly those which contain an acid or some preparation of iron. It is sometimes recommended that these should be taken through a glass tube, but this does not efficiently protect the teeth. The only satisfactory way to do so is to make the patient use a tooth brush with alkaline powder freely after each dose of the medicine, or to rinse out the mouth with a solution of bicarbonate of soda (a teaspoonful to the tumblerful).

Treatment of Toothache.—The occurrence of toothache, is usually an indication that the child should be put under the care of a dentist. There are, however, one or two

applications to the teeth which are often of service in temporarily relieving the pain. If there is an accessible cavity a fragment of cotton wool dipped in clove oil and inserted into it will sometimes soothe the aching. Considerable relief is sometimes afforded by holding in the mouth a quantity of a hot solution of bicarbonate of soda, and lastly, a dose of Gregory's powder (grs. v-x) will often stop the pain of a carious tooth. If there is pain over the jaw and a threatening gumboil, the old fashioned plan of putting a stewed fig between the cheek and the gum is a good one. Moist heat should not in such cases be applied to the outside of the face.

DENTAL ABNORMALITIES.

Many of the abnormalities of form of the teeth, and probably all abnormalities in their number and position, are only of interest to the dental surgeon and pathologist. There are, however, certain changes in their form which have a wider significance as giving information relating to the general health or past history of the child.

Traces of Grinding the Teeth.—We often find indications that the child grinds his teeth. This is shown by flattening of the tips of those teeth which are most prominent, and the canines are therefore most markedly affected. This does not occur from ordinary chewing; it is only seen when there has been grinding of the teeth for a considerable time, and it may be looked upon as a physical sign of brain irritation. The irritation which it indicates may be connected with severe brain disease (*e.g.* meningitis) or it may be of the passing and comparatively harmless sort which results



reflexly from injudicious feeding, or the presence of worms, or from too much excitement in a nervous but otherwise healthy child. If we are told that a child who has markedly ground teeth sleeps quietly and well, we may suspect, as Dr Warner says, "that it is the nurse who sleeps soundly and not the child."

Defects in the Calcification of the Enamel.—These are often seen in the permanent, and more rarely in the temporary teeth, forming a discoloured transverse furrow which passes across the front of the incisors and canines, and often also implicates the crowns of the molars. This indicates that at the period of the child's life at which the calcification of that part of the enamel was proceeding, something occurred to check its progress. The condition is analogous to the grooving of the finger nails which we observe after fevers. The calcification of the enamel of the temporary teeth takes place before birth. That of the permanent ones begins about the time of birth. A groove across the middle of the central permanent incisors may be due to an acute illness which took place in the third or fourth year. Many grooves of this kind, however, occur for which no corresponding history of illness can be obtained.

Mercurial Teeth.—This is the name given by Mr Jonathan Hutchinson[1] to an abnormality of the permanent teeth, which is due to interference with the development of the enamel, either from simple stomatitis, or from that which follows the administration of mercury. The teeth affected in this way are rugged, pitted, or dirty on the surface. The first molars, incisors and canines are the teeth which show the condition

[1] *Illustrations of Clinical Surgery*, Vol. I., 1878, p. 53.

most frequently; the pre-molars escape. The effect of the stomatitis is usually confined to an interference with the development of the enamel, and rarely of the dentine. It does not cause arrest of development of the tooth as a whole in the way that congenital syphilis does.

Congenital Syphilitic or Hutchinson's Teeth.—(Fig. 3). This variety of dental abnormality is important, because as Mr Hutchinson says, "It is, if taken alone, by far the most valuable of the signs by which we recognise in adolescents the effect of inherited syphilis."

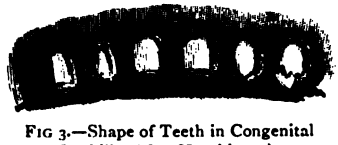


FIG 3.—Shape of Teeth in Congenital Syphilis (After Hutchinson).

The characteristics of these teeth are not sufficiently known, and abnormal and peculiar teeth of other kinds are often erroneously regarded as proofs of congenital syphilis. The main points about "Hutchinson's Teeth" are as follows:—

(1). It is always *the permanent teeth* which are affected thus. The temporary teeth in syphilitic infants often decay early, but they present no special peculiarities of form.

(2). The only teeth which afford incontestible evidence of congenital syphilis are the *upper central incisors*. The first molars, the other incisors and the canines often afford corroborative evidence, but they are never to be trusted to alone.

(3). The characteristic peculiarities which distinguish these central incisors are as follows:—They are *dwarfed*, being too short and too narrow; and sometimes the portion of the upper jaw from which they grow is also arrested in



growth. They often *stand somewhat apart* and slope towards one another. They are unusually *rounded* on section; they are "*pegged*" (that is to say, the teeth are broader near the gum than at their free edge); and they are *notched*. The notch is usually shallow and the dentine is exposed at the bottom of it. It is formed by the breaking away of the imperfectly developed central portion of the edge. The teeth are generally *not of a good colour*, and they are *abnormally soft*, so that by the time the patient is 20, they may be ground down like those of an old man.

The first molars are next in diagnostic importance to the upper central incisors. When characteristic they are spoken of as "dome-topped." Their sides slope towards the centre over which the enamel is defective. As might be expected, syphilitic teeth not infrequently present the characteristics of mercurial teeth in addition to their own.

CHAPTER III.

ON GENERAL CLINICAL EXAMINATION, CLINICAL HISTORY, AND PHYSIOGNOMICAL DIAGNOSIS.

GENERAL CLINICAL EXAMINATION.

THE methods of clinical examination in older children are the same as those used for adults and can be applied in the same order. In infants and little children, however, the details may have to be considerably modified and the examination hastened, because the patient is unable to endure it for more than a very short time.

In the first place, *our methods differ somewhat in their relative value* in children and adults. Thus, inspection plays a larger part in the diagnosis of disease in infancy than it does in later life. This is partly because it is more easy of application, as children are usually stripped for examination and are thus more easily seen. Partly also because they show more readily by their gestures and expression what they are feeling, and the signs of present disorder are less often in them than in adults obscured by the traces of past disease. Palpation also is much more applicable to children than to grown-up patients, not only because their bodies are smaller and softer, but also because they are so used to being handled all over by their mothers



and nurses that it is not to them the unusual and unpleasant process that it is to adults.

There is usually also *considerable difference in the order in which the methods are to be used.* In adults, it is generally found useful in most cases to follow habitually much the same order of procedure—such as is found in the ordinary case-taking forms—although it may be varied somewhat in different cases. In children, the order is changed, in accordance with the general rule that it is always better to take the more unpleasant parts of the examination last, so that any inevitable crying and resistance may be deferred as long as possible. For example, the mouth and throat are among the last parts to be inspected. Were they examined early, in many cases the child would begin to cry, and the further investigation of his organs be rendered more difficult. Similarly, as some children are frightened by even light percussion it is better as a rule to auscultate first, and to percuss afterwards. Again it is important to count the pulse and respiration early, before the child has been much disturbed.

As a general rule while in examining adults we proceed *system by system*, investigating in turn the alimentary, circulatory, respiratory and other organs, in children, we go rather *by methods* so to speak; inspecting first as much as we can without touching, then palpating all over, then auscultating, and so on. There are, however, of course, many exceptions to this rule.

ROUTINE EXAMINATION.

Before discussing the examination of the different parts of the body, it will be well to describe briefly the investiga-



tion of an ordinary case so as to illustrate the usual order of proceeding. Of course most physicians have their own order, and that given here, which is founded on Dr West's chapter on the subject, is only offered as one of many which work well.

To begin with then, before the child is seen, it is well to make a few *preliminary inquiries* into his history and symptoms, so as to know to what point especially attention should be directed. It is also advisable that the child should be stripped before the examination is begun. If he is hurriedly undressed in the presence of a stranger it is very likely to make him cry. It is best therefore, if possible, to begin with, to have him rolled in a blanket, with or without a loose nightdress on, and sitting or lying on his mother's or nurse's knee. Little children, even when they are seriously ill and feverish, are generally better there than in bed, because they feel safer and are less easily put out.

The investigation commences with *inspection*, but it is very important not to go close to the child and stare at him or he is very likely to cry. Sit first a little way off and finish your conversation with his mother or nurse. While you are doing so, unobserved by him, notice as much as you can. Observe the state of his development and nutrition, his complexion and expression, and the form of his head and any other uncovered parts; also whether he has signs of rickets or syphilis or any other disease past or present. Notice whether he is listless or lively, good-natured or irritable, and whether his demeanour is that of a normal child or in any way abnormal. Note also if his respiration is difficult; and, if he cries or coughs, observe



the character of the sounds he makes, and count the respirations.

Then comes *palpation*, and by this time the child has got a little used to your presence, and may allow you to feel his pulse without apparently noticing that you are doing so. It is essential to count the pulse without annoying or frightening him, because otherwise it will be so quickened by his emotional excitement that its enumeration will be useless. If the child is shy it is always well to let his mother hold his hand in hers while you are feeling the pulse, as this makes it less likely that he will be frightened.

You will next lay your hand (thoroughly warm of course) on the abdomen, before the child is laid down or his body uncovered. While palpating thus you learn the condition of the skin, its temperature (approximately), and whether it is soft and normal or dry and harsh as in chronic wasting disease. On deeper palpation you will ascertain the condition as to the size of the liver and spleen, and the presence of any abnormal swelling or tenderness. The hand may then be passed over the thorax and you will feel the amount of rickety beading, if any is present, and the position and character of the heart's impulse. You may also find rhonchal fremitus over the lungs or a cardiac thrill. The limbs should then be felt and their size, muscularity and other characteristics estimated.

The hand is then passed over the head, its temperature and degree of moisture noticed, and the state of the fontanelle and the presence or absence of cranio-tabes investigated. The neck also should be felt, and the exact position of any enlarged lymphatic glands made out.

Auscultation, if the child is nervous (and clean), may be



practised first by the ear being laid to the chest with only the night-dress or a handkerchief intervening. The advantage of the direct method of auscultation is that it frightens the child less. For thorough examination, however, the stethoscope should be used and a binaural with a short chest-piece is best for most purposes. The advantage of having the chest-piece short is that, where the child is sitting on his mother's knee, his chest is close to hers, and in examining the side which is next to her there is only room for a short chest-piece to turn in. It is well to auscultate the back first, as it is on the whole the most important part, being the commonest site of many diseases (*e. g.*, empyema and collapse), and also the place where fluid secretions in the bronchi are most likely to be heard, if the infant, as is probable, has been lying down.

Percussion follows auscultation. It must always be light, and care must be taken to see that the child is sitting straight. Last of all, the mouth and tongue have to be inspected and the gums and fauces seen and if necessary felt. This is the most unpleasant part of the whole process from the child's point of view, and is therefore best deferred until the end. The temperature may be taken before the examination begins or at any period during it.

Should the child be *asleep* it is important to examine him before he wakes, so far as is possible, noting the character of his sleep, whether quiet or restless, the attitude he assumes &c., (see p. 19). It is also very important to count the respiration and feel the pulse before the child wakes, as this may be the only opportunity of ascertaining their undisturbed condition. If the child has any noises accompanying his breathing when awake, note if they are



also present during sleep, and if so to what degree. In many cases the abdomen may be palpated and the heart auscultated before the child wakes; some children are not aroused even by the use of the ophthalmoscope. If the child has to be wakened this should be done by the mother or nurse, and in any case a strange face should not, if possible, be the first to meet his eye.

CLINICAL HISTORY.

The patient himself can usually of course tell us nothing at all with regard to his case. His friends also rarely give us all the facts we wish. Such details, however, as we do elicit from the mother and nurse are often of the greatest possible importance, and we must never neglect getting as careful an account as we can, not only of the child's family history and previous health, and the onset of his present attack, but also of the particulars of his present complaints and symptoms and the changes of every kind noticed in him since he took ill.

Generally speaking, while the theories of the mother and nurse as to the cause of the child's illness are of no importance, their observations on matters of fact are often valuable, as they have abundant opportunity for observing the child and much interest in doing so. Their opinion as to whether the child is getting better or worse is generally correct and should never be made light of. It is especially important, however, never to trust to the mother's account of the appearance of the urine and fæces, or of any other feature of the case which it is possible for you to investigate for yourself.

You may arrange your questions under the following



heads. (1) Mother's complaints; (2) Family history; (3) Previous health and treatment; and (4) Present illness.

(1). **Mother's complaints.**—It is always important, to begin with, to ascertain why the mother has brought the child for advice,—which of his ailments, that is to say, bulks most largely in *her* estimation.

(2). **Family history.**—The family history is also important in some cases, especially in connection with the diagnosis of tubercular, rheumatic and nervous cases. It is also important to know about the mother's health, particularly whether she was well during her pregnancy. The number of other children should also be ascertained and where the patient comes in the family; and it is well to enquire whether any of the other children have suffered from tuberculosis, congenital syphilis or any other special disease.

(3). **Previous health and treatment.**—In investigating the former medical history of the child, it is well to begin by asking about the nature of the labour and the state of the child at birth. His growth and development of body and mind must then be enquired into; when his teeth began to appear, when he first began to walk and to talk and so on. It is of great importance also in young children to know about the previous feeding. If the child was on the breast, and if so for how long; if not, what he was given instead of the breast-milk, and at what age he first got solid food. It is also important to know what sort of a diet he has recently been getting.

You will then enquire about previous symptoms of disease. A history of "snuffles" and a peculiar rash in early infancy may be important as indicating congenital syphilis. Recurrent attacks of bronchitis, with alternate

constipation and diarrhoea and muscular debility, would suggest the probability of previous rickets. The occurrence and dates of attacks of infectious disease are always important. In the case of obscure acute symptoms the fact of the patient's having been recently exposed to the infection of one of the exanthemata may greatly aid in the diagnosis, and the periods of incubation of these must be kept in mind.[1] Sometimes the fact that an attack of measles or whooping cough has preceded an obscure illness by a few months is a point in favour of the case being one of tuberculosis. In cases of brain-disease it is well to enquire as to previous otorrhœa. This condition, however, is so extremely common in childhood, especially among the poor,[2] that too much importance must not be attached to it.

(4). **The present illness.**—It is often very difficult to get a clear account of the present illness. It is best to begin by ascertaining its duration, and this is done by finding out the exact date when the child was last evidently in his normal state; and then to ask about the ways in which he has shown that he is not well, his sleep, appetite, energy, temper, appearance and complaints.

PHYSIOGNOMICAL DIAGNOSIS.

Before entering upon a description of the different organs and parts of the body, it will be well to consider briefly the advantage to be gained from a study of the appearance and expression of the child's face and the attitude of his body and limbs. This is generally spoken of as physio-

[1] See Appendix A.

[2] Among the children under four years, attending the Sick Children's Hospital Dispensary, about 20 per cent are found to be suffering, or to have suffered, from otorrhœa.



gnomical diagnosis. Under normal conditions the child's face is comparatively free from those lines and furrows which are regarded in adults as denoting character, and consequently it is the more easy to read when it bears the impress of disease. Some of the changes which disease produces in the physiognomy are indeed so definite and constant that they may almost rank among the physical signs.

In examining young children it is especially important to be practised in the art of physiognomical diagnosis; because, as they are not able to bear so prolonged an examination as adults, it is the more important to be guided as soon as possible to the part most needing investigation. While physiognomical diagnosis, however, should be practised on all occasions, it is extremely important not to trust to it for such information as can only be acquired with accuracy by the ordinary and more laborious methods of examination. If it is employed as a substitute for, instead of as an introduction to, a more methodical examination, the result will be far from satisfactory.

Skill in reading the significance of the gestures and facial changes is only acquired by long practice. A few of the changes which are most frequently met with, are well seen in the accompanying photographs. In indicating some of the more important points to be observed in them I shall make free use of Professor Soltmann's observations, whose valuable paper[1] on this subject is worthy of careful study.

[1] "Ueber das Mienen-und Geberdenspiel kranker Kinder." *Jahrbuch für Kinderheilkunde*, Bd. XXVI., S. 206.



FIG. 4.—Pleuro-pneumonia, before the Crisis. Boy, aged 22 Months.



FIG. 5.—Pleuro-pneumonia, a Week after the Crisis. The same child.





Pleuro-pneumonia.—The first photograph (Fig. 4) is of a boy of twenty-two months taken on the fifth day of an attack of acute pleuro-pneumonia which involved part of the base of the right lung.

The child is too ill to notice much or to hold up his head, which is lying back on his mother's arm. His face is flushed and his eyes bright, although their expression is dull and anxious. His eye-brows are oblique from the action of the corrugator supercilii on each side along with that of the central bundle of the frontalis. His nostrils are dilated and working, the angles of the mouth are lowered and the lips slightly parted, so as to admit a little air during the laboured breathing. The general expression of the child's face is that of suffering, modified by the desire not to cry because of the pain which a long breath would cause.

Fig. 5. represents the same child nine days later, after the temperature had been normal for more than a week. The abnormal points in Fig. 4 become much more evident when you compare it with this one. Here, the child is thinner, but his general expression is that of health, comfort, and intelligent observation.

Meningitis.—Figs. 6, 7, and 8 illustrate the physiognomy of brain disease. This is an important facies to recognise, because in so many cases the other symptoms of brain disease are equivocal during the early stage, and it may be doubtful whether the lesion is in the cranium or the chest. Under these circumstances, much may be learned from the expression of the face.

The look that brain disease gives to a baby's face is a very strange one, because it suggests the presence of

emotions which are quite foreign to infancy. This is seen in a marked degree in Figs. 6 and 7 which represent a baby of five months who was dying of simple chronic meningitis.

His eyes are closed, and he is knitting his brows. According to Professor Soltmann it is the hyperæmia of the retina associated with the brain condition which produces this effect on the face, just as bright light might do. The central irritation is producing very tight contraction of the masseters and there is also some retraction of the head. The general aspect of the upper half of the face is that of deep and earnest thought, while the clenched jaw and slight drawing back of the head give almost the impression of stern determination. Although the baby is much emaciated his fontanelle is full and bulging.



FIG. 9.—Facies Hippocratica. Girl, aged 10 Months.

Fig. 8 is from a photograph of a baby of 11 weeks, suffering also from meningitis. The very unchildlike look of profound meditation, as well as the squint and the unequal opening of the sightless eyes, are very noticeable.

The Hippocratic Facies of Impending Death.—Fig. 9 is of an infant, aged 10 months, moribund from severe septicaemia with diarrhoea and catarrhal pneumonia. The child was evidently delirious, grasping in the air in front of her, as if she saw things. Note the hollow staring eyes,



FIG. 6.—Non-tubercular Meningitis. Boy, aged 5 Months.



FIG. 7.—Non-tubercular Meningitis. Boy, aged 5 Months.



FIG. 8.—Meningitis. Girl, aged 11 Weeks.



the dilated nostrils, and the dropping of the lower jaw. This photograph may be taken as representing the "facies Hippocratica" as it is seen in an infant. Hippocrates, in describing a dying man, speaks of the "sharp nose, hollow eyes, collapsed temples, the ears cold, contracted, and their lobes turned out. The skin about the forehead being rough, distended and parched; the colour of the whole face being green, black, livid, or lead coloured."

Adenoid Physiognomy.—Fig. 10 represents the common appearance of the face, seen in children suffering from obstruction of the naso-pharynx by adenoid vegetations. There is a general dull expression, and the mouth is almost constantly open. The nostrils are very narrow, the alæ nasi are defective, and present at the junction of the superior and inferior lateral cartilages, a more or less distinct dimple. There is often, as there was in this case, a tendency to running at the nose, and its extremity is apt to be red, especially in cold weather.



FIG. 10.—Adenoid Physiognomy.

The degree to which the adenoid physiognomy is present indicates the amount of obstruction to the process of nasal breathing, rather than the amount of the adenoid vegetations. The latter may be present in considerable bulk, and may be doing harm in reflex and other ways, but if they do not obstruct the free entrance of air through the naso-pharynx, they will not cause this alteration of the facial appearance.



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of the case can scarcely escape recognition (Fig. 13). In some cases, however, the rash though copious is not characteristic, or it may be obscured by being complicated by an ordinary erythema or eczema, and often it is so slight in amount as to be difficult to recognise at the time the child is seen. In these circumstances we are sometimes helped in our diagnosis by the *distribution* of such skin lesions as are present. The most characteristic situations for specific eruptions at this age are the eyebrows, the lips and chin, the anus and genitals, the thighs and the palms and soles; and often a few little scaly brownish patches in one or more of these situations is all that can be found. If the palms and soles are reddish and shining as if they had been brushed over with gum, and especially if there be any desquamation about them, this is suggestive of congenital syphilis.



FIG. 13.—Congenital Syphilis. Girl, aged 3 Months.

In cases where the eruption has passed off before the child is seen, its nature may be recognised from the brownish stain it has left, or, if it has been round the mouth, by a certain degree of *fissuring* remaining, or there may be some *depression of the bridge of the nose* (Figs. 14, 40). Should the child's cry have a laryngeal or *hoarse character*, that is strongly in favour of his being syphilitic, and any *enlargement of the spleen* points in the same direction.

An important indication of congenital syphilis in young



babies, which is not uncommon, is the occurrence of so called *syphilitic pseudo-paralysis* due usually to epiphysitis. This may occur in any of the limbs and is often multiple. It is met with most commonly at the upper end of the humerus or at the bones near the elbow. It is noticed that the child never moves the affected limb voluntarily, and cries when it is touched or moved for him. There may be little or no ascertainable enlargement of the affected bone. This condition occurs generally between the fifth and twelfth weeks of life. It may sometimes be met with apart from any other specific symptom, but it at once indicates the nature of the case. *Condylomata* are sometimes found round the anus and their occurrence is conclusive as to the specific nature of the case. In some cases of congenital syphilis there is nothing to be discovered but *general wasting*. In these, the effect of a few doses of grey powder may afford great help in the diagnosis by causing a marked improvement in the general condition.

In settling the diagnosis of a doubtfully specific case in an infant, it is rare to gain much from interrogating the mother as to her own symptoms. A history of specific symptoms may sometimes be obtained, but in many cases it is impossible to get any account of her having suffered from anything characteristic.

In later Childhood and Adolescence.—In older children the presence of a congenital syphilitic taint is diagnosed (a) If traces of past syphilitic disease are found ; (b) If the morbid condition which they are suffering from is of an undoubtedly specific character.

(a). *Traces of past syphilitic disease.*—A large number of syphilitic children grow up showing no trace of their past



FIG. 14.—Congenital Syphilis. Boy, aged 3 Months. Nasal Deformity, Fissured Lips.



FIG. 15.—Congenital Syphilis. Boy, aged 10 Years. Square Forehead, Keratitis, Depressed Bridge of Nose, Characteristic Teeth.



syphilitic ailments and as the permanent alterations of the teeth, bones, etc., are only found in a proportion of cases, their absence proves nothing. The traces of past syphilitic disease which are most frequently found are the following :—

(1). The characteristic deformity of the permanent teeth (Figs. 3, 15). Its importance in diagnosis has already been considered (p. 38).

(2). Absorption patches in the choroid, situated usually towards its periphery.

(3). Bossing of the head in older children, although less distinct than that seen in young infants, is important. It consists mainly in a general thickening of the bone which gives the forehead a heavy square appearance (Fig. 15).

(4). Depression or broadening of the bridge of the nose.

(5). Fissuring of the lips and the adjacent skin is very characteristic (Fig. 18).



FIG. 16 —Congenital Syphilis. Boy, aged 7 Years. Nodes on Tibiæ.

(b). *Essentially or probably specific lesions.* —The most common of the morbid conditions which are so characteristic of congenital syphilis that their presence is suspicious or even pathognomonic of the disease, are as follows:—

(1). Interstitial keratitis, which in the great majority of cases is due to congenital syphilis (Fig. 15).



(2). Sudden incurable deafness from disease of both internal ears.

(3). The occurrence of periosteal nodes ; tender swellings which are painful at night on the surface of one or more of the long bones—most commonly the tibiæ (Fig. 16).

(4). The spontaneous occurrence of sub-acute or chronic synovitis of both knee-joints with considerable swelling and little or no pain. This is not uncommon in congenital syphilis, and is very rare indeed from other causes.

(5). Phagedænic ulceration of one of the mucous membranes such as that of the nose or throat, or of the skin (Fig. 17).



FIG. 17.—Congenital Syphilis. Girl, aged 14 Years. Square Forehead, Phagedænic Ulceration of Nose, Ear and Neck.



FIG. 18.—Congenital Syphilis. Girl, aged 16 Years. Broad Bridge of Nose, Fissuring round Mouth.





CHAPTER IV.

ON THE EXAMINATION OF THE HEAD, NECK, ABDOMEN, FÆCES, BACK AND LIMBS.

THE HEAD.

THE size, shape and ossification of the cranium including the condition of the fontanelle and sutures, are the main points to which attention should be directed in examining the head.

Size.—At birth, the circumference of the infant's head measures, on an average, 13 to 13¾ inches. At first it grows rapidly so that it has usually gained 3 inches by the time that he is six months old, and by the end of the first year measures about 18 inches. During the second year the circumference increases by about 1 inch. At five years old the average child's head measures from 20 to 20½ inches, and at ten, about 21 inches.

The normal variations in the size of the head are considerable, and sometimes children are seen with curiously long and large heads, whose intellectual development is quite satisfactory. As a general rule where the head is unusually small or large from causes which interfere with the health of the brain, there will also be found some characteristic change in its shape. It is only when the variations in size are great that they are to be considered really morbid. In many idiots, the head is

abnormally small, although they are not, strictly speaking, cases of microcephalus.

Shape.—Asymmetry of the cranium is frequently seen in infants who are otherwise normal or merely rickety, and the condition is generally of no practical importance.

Microcephalic crania (Figs. 19 and 20) are recognised not only by their small size, but also by their peculiar shape.



FIG. 19.—Microcephalus. Girl, aged 4½ Months.



FIG. 20.—Microcephalus. Girl, aged 2 Years.

The forehead is very small and receding, the vertex somewhat pointed, and the occiput flat. The fontanelle closes prematurely.

In *hydrocephalus* (Figs. 21 and 27) the head is not only enlarged both antero-posteriorly and from side to side, but its shape is more globular than in any other condition. In doubtful cases we are helped in the diagnosis by observing the somewhat downward direction of the eyes, which is shown by the high level at which the lower lid crosses the eyeball and the unusual amount of sclerotic seen above the iris. The large and bulging fontanelle which is often patent up to four or five years of age is also a striking feature, and

the defective ossification of the edges of the cranial bones resulting from internal pressure. When the head is enlarged, the superficial veins of the scalp are usually dilated.

The chief characteristic of the ordinary *rickety cranium* is its squareness (Fig. 22), the top of the head, the sides and the face all tending to be flatter than usual. The head itself is usually rather larger than it should be for the child's age, and a good deal too large for the size of his body.



FIG. 21.—Chronic Hydrocephalus. Boy, aged 9 Months.

In many cases of rickets, the form of the head becomes further changed by the outgrowth on its surface of osteophytic nodes, or bosses as they are usually called. These are bony thickenings of



FIG. 22.—Rickets. Boy, aged 2½ Years. Square Shape of Head.

the outer table of the skull, and they sometimes grow until the bone is fully half an inch in thickness. When they are large the skull is sometimes described as natiform,

and the fitness of this name can be readily appreciated by looking at such heads as are shown in Figs. 23 and 24. It is believed that bosses form more frequently and are larger in size in children who are suffering from congenital syphilis as well as rickets, than in those who are only rickety.

The Ossification.—This is investigated by palpating the anterior fontanelle, the sutures, and the back of the head (for craniotabes).

The Fontanelle.[1]—In the cranium of the new-born child there are six fontanelles situated at the various corners of the parietal bones. Except in some cases of rickets and hydrocephalus, the posterior and the four lateral fontanelles are quite closed within a few weeks of birth. The anterior therefore is the only one which is of much clinical importance, and it is generally spoken of as "the fontanelle." The characteristics of the normal fontanelle which have to be noticed are its shape, edges, tension, level, pulsation and size.

In *shape* the anterior fontanelle is somewhat rhomboid with slightly curved borders which are convex inwards. Its bony *edges* are felt distinctly at their junction with the membrane, and are somewhat rounded. Should they be so thin and yielding that there is difficulty in determining where the bone stops and the membrane begins, this indicates cranial rickets or increased cranial pressure, or both.

The fontanelle like the eyeball has a normal *tension*. Its membrane is stretched somewhat tightly between the bony edges and is at about the same level as they are. Any

[1] See C. Hochsinger, Studien über die klinischen Verhältnisse der Stirnfontanelle, *Wiener Klinik*, July, August, 1892, which contains the best account of the normal and abnormal conditions of the fontanelle.



FIG. 23.—Natiform Cranium.
Boy, aged 2 Years.



FIG. 24.—Natiform Cranium.
Boy, aged 12 Months.





change in the intra-cranial pressure affects the tension and *level* of the fontanelle so that it either bulges out above the surrounding bones or becomes depressed and hollowed out. There is normally a slight rhythmic *pulsation* of the fontanelle transmitted from the arteries at the base of the brain. It is increased if the tension is moderately raised, but ceases if it is either greatly raised or lowered to any considerable extent. If the ear or the end of a stethoscope is applied over the fontanelle, a systolic murmur can often be heard. This murmur has been much studied, but so far as our present knowledge goes it is of no diagnostic value.

The *size* of the fontanelle is the last point. It normally closes in the second year—generally between the fifteenth and eighteenth months. Whether it steadily decreases in size from birth until its closure (Kassowitz) or first increases for several months and then diminishes, as most authorities have stated, is still a matter of dispute. If the area amounts to a square inch at eight months old, we may regard it as too large.

The conditions of the fontanelle which are most important from a clinical point of view are as follows :—

(1). *Alterations in size and date of closure.*

(*a*). Delay in the normal closure of the fontanelle and its enlargement are caused by three morbid processes. Firstly, it may be due to hydrocephalus or any other morbid condition which increases the cranial contents. Secondly, and much more commonly, it is caused by rickets, so that if the fontanelle is large at eighteen months, or open at all after the second year, rickets should always be suspected. Thirdly, in untreated cretins and in some other dwarfs the fontanelle shows no tendency to close in



childhood, and may be found widely open in adults of thirty or forty years old. Simple malnutrition does not seem to delay the closing of the fontanelle.

(*b*). Premature closure is a valuable early sign of microcephalus, in which condition it may be quite closed by the age of four or five months.

(2). *Alterations in the tension and level of the fontanelle.* These are extremely important owing to the information they supply as to the intra-cranial tension, thus :—

(*a*). Slight increase of its tension with some slight bulging outwards is caused by cerebral hyperæmia, active or passive. We see it therefore in acute feverish conditions, in whooping-cough or chronic bronchitis, and always, temporarily, when the child coughs or cries.

(*b*). Great tension with marked bulging indicates a considerable increase in the contents of the skull, such as is found in hydrocephalus or cerebral tumour. It is seen also in new-born children when there has been an extensive intra-cranial haemorrhage.

(*c*). Abnormal depression with diminished tension of the membrane indicates lowering of the vital powers. It is met with in acute cases of diarrhœa, from the rapid loss of fluid which takes place. It is also characteristic of cases of wasting from any cause.

In cases of diarrhœa with cerebral symptoms ("hydrocephaloid") the presence of this sign is most useful in helping to distinguish the condition from real hydrocephalus (meningitis). When it is present to a marked degree in diarrhœa it is to be regarded as an urgent indication for the free use of stimulants and external warmth.

(*d*). A condition of normal tension of the fontanelle,



along with cerebral or meningeal symptoms, is often met with and is of great diagnostic importance. It occurs *e.g.* in cases of "cerebral" pneumonia (that is cases of pneumonia in which there are prominent cerebral symptoms, such as head-retraction and fits) and it is sometimes of value in differentiating these from cases of pneumonia complicated by meningitis. It is also useful in the diagnosis of cases of enteric fever with cerebral symptoms from meningitis. Generally speaking it may be said that in feverish cases in young babies, cerebral symptoms do not indicate the presence of intracranial disease unless they are accompanied by a bulging fontanelle. We occasionally, however, meet with distinct exceptions to this rule.

The Sutures.—The main sutures should also be felt. Any gaping of them with thinning of their bony margins has the same significance as enlargement of the fontanelle.

Craniotabes.—Craniotabes is the name given to thinning of the cranial bones. In its slightest form it causes a softening of their edges, with widening of the fontanelle and sutures, such as has been already referred to. When it is present to a marked degree we find little rounded areas of thinned bone at some distance from the sutures. These yield before the point of the finger and give a slight sensation of crackling like that of parchment. They are found most frequently on the parietal, and occipital bones near the lambdoidal suture, and sometimes the absorption of bone goes so far that there is nothing but a little window of membrane left at each of the affected areas.

In rare cases considerable areas of the cranial bones are membranous at birth, and for months after, without there

being any signs of rickets or any indication of a cause for the condition. Craniotabes is sometimes due to chronic hydrocephalus; in the great majority of instances, however, it is merely a manifestation of rickets, and it is generally found to some degree in any young baby who has marked rachitic symptoms. The most severe degrees of this condition, however, are rarely found except in children who are syphilitic as well as rickety, and it is believed that syphilis predisposes to its occurrence.

EXAMINATION OF THE NECK.

The neck must be examined for **enlarged lymphatic glands**, and when these are found their exact position must be noted and the area of skin or mucous membrane with which they are connected examined to discover the reason of the enlargement. If, for example, a number of superficial enlarged glands are found along the posterior border of the sterno-mastoid muscle, there probably is, or has recently been, some irritation in connection with the scalp, such as that produced by pediculi. Enlargement of the sub-maxillary lymphatic glands, if there is no visible cause for it on the face, generally indicates some irritation from the gums or teeth, and in the same way sores on the chin, the lower lip or on the front of the tongue, give rise to the enlargement of the supra-hyoid gland.

The upper set of deep cervical glands near the angle of the jaw, drain the naso-pharynx, the pharynx, and all the neighbouring parts, and as their area of distribution includes a very large amount of adenoid tissue, they are more frequently enlarged than any other. Their rapid enlargement on one or both sides generally signifies some lesion



in the area which they drain, and conversely, their being of quite a normal size is in favour of there being no serious or acute throat affection.

In examining infants of a few months old, one sometimes finds a **hæmatoma of the sterno-mastoid**—or sterno-mastoid tumour, as it is sometimes called—situated in the substance of the muscle. This is due to injury of the muscle occurring during labour, but as the swelling is mainly caused by secondary overgrowth of fibrous tissue—"muscle-callus"—it is generally not discovered until some weeks after birth.

Rigidity of the neck in infants, or its **retraction**, represent two degrees of an interesting and important symptom, to which we shall return in considering the diagnosis of nervous disease. In older children a stiff neck is often a manifestation of rheumatism; but may indicate the presence of rheumatoid arthritis or cervical caries.

THE ABDOMEN.

Inspection.—The infant's abdomen is normally more prominent than the adult's. This is due partly to the great tendency there is to the accumulation of gas in the intestine, and to the walls of the bowel and those of the abdomen being very easily distended by it; partly also to the relatively large size of the liver, and to the fact that the narrowness of the thorax makes the abdomen look, by contrast, even larger than it really is. Chronic dyspepsia gives rise to increased distention of the abdomen with gas, and this is apt to be attributed by anxious parents to serious abdominal disease. Enlargement of the abdomen is of course also often caused by increase in size of some of the organs or by the presence of a tumour or ascitic fluid.

In inspecting a distended abdomen, it is important to note the exact position of the distention, and if it is uniform or confined to one region only. It must also be noticed if there is any marked dilatation of the superficial veins, if the umbilicus is protruding, and if there is any tinge of redness about it. In cases of wasting, the skin of the abdominal wall often presents little colourless elevations scattered over its surface. These look like raised nodules, but on feeling them with the finger they are found to be quite soft; they consist of distended lymph-spaces. In severe protracted cases of diarrhœa and tuberculosis, we may find small ecchymoses in the skin of the abdomen; they indicate a dangerous degree of weakness.

Retraction or hollowing out of the abdomen is a very significant sign of cerebral disease.

Palpation.—In palpating the abdomen, it is important to ascertain if there is any pain on pressure. This is sometimes difficult to discover, because the child may cry, when touched, from general uneasiness. If, however, the presence of tenderness can be ascertained beyond a doubt, it is very significant, and in the great majority of cases indicates the presence of peritonitis. Absence of tenderness is less important. In many cases of tubercular peritonitis there is none, and even in acute peritonitis we may be unable to make sure of its presence.

Enlargement of the abdominal organs and the presence of tumours in this region are much more easily ascertained by palpation in children than in adults, owing to the thinness and softness of the abdominal walls. The investigation by palpation of morbid conditions in the abdomen is greatly



aided by the use of chloroform, and by combined rectal and abdominal examination.

Percussion.—Percussion is useful in determining the state of the stomach and bowels, and in confirming the results of palpation as to the size and position of various other organs. It is also of great value in investigating the presence of free fluid.

The Liver.—The lower margin of the liver can usually be made out by palpation as well as by percussion. It reaches further down in children than in adults, usually extending to half an inch below the costal margin in the right mamillary line. This is partly due to the organ being relatively larger than it is in after life, and partly to the ribs lying more horizontal, and consequently leaving more of it uncovered (Sahli.)

Diminution in the size of the liver is exceedingly rare in childhood. It occurs in acute yellow atrophy, and in advanced stages of cirrhosis.

Enlargement is common, and may be due to many causes, of which the commonest is fatty accumulation. It may also be due to waxy disease, cirrhosis, the passive congestion of heart disease or mediastino-pericarditis, to tumour formation, &c.

The Spleen.—The spleen is best investigated in children by palpation. To examine it you stand on the child's right side, and laying your right hand on the left side of the abdomen, with the first two fingers over the left hypochondrium, press inwards and upwards. In some cases where the spleen is normal in size, and always if it is enlarged, its rounded edge will be felt as a soft and readily movable body. It is always well, before beginning to feel for the

spleen, to ascertain the position of the lower costal margin, as the cartilages of the floating ribs may be mistaken for the border of an enlarged spleen. If the child allows you a fair opportunity of palpating the spleen, and you do not feel it at all, you may rest assured that it is not enlarged. If you feel it at or about the level of the costal margins, it is either normal or only slightly increased in size. If, however, it is distinctly below the level of the ribs, it may be regarded as abnormally large. When great enlargement is present, the organ may reach right down into the pelvis.

Great enlargement of the spleen is frequently met with in children, and may be due to many causes. In children born with active manifestations of congenital syphilis it is probably always enlarged. In the more common cases, where the symptoms of that disease only set in after some weeks or months, it may be found before these appear; but often it comes rather late in the course of the active symptoms, and it generally persists longer than any of the other manifestations.

In rickets (*q.v.*) enlargement of the spleen is also frequently met with and it may attain considerable dimensions. It is enlarged also in typhoid fever, hepatic cirrhosis, malaria, leucocythæmia, pseudo-leucæmia, and sometimes in tuberculosis.

The Mesenteric Glands.—Tubercular affection of the mesenteric glands is a very common condition in childhood from a pathologist's point of view. Clinically, however, it is only occasionally that we are able to make sure of its presence during life, as in many of those cases in which the glands are much enlarged there are other changes in the abdominal cavity which render them difficult of palpation.



Rectal Exploration.—In the examination of the abdomen in children, rectal exploration is often extremely important. Occasionally a simple examination with one finger may be sufficient as in searching for a rectal polypus, which is a common cause of rectal hæmorrhage in early life.

A bi-manual examination, however, with the forefinger of one hand in the rectum and the other hand on the front of the abdomen is of special value in the diagnosis of many forms of abdominal and pelvic disease, as has been pointed out in an interesting paper by Dr George Carpenter.[1] This method of examination should be had recourse to in all cases of severe and obstinate constipation, in spinal disease with possible abscess formation, and in cases of abdominal tumour. In tubercular peritonitis it is also sometimes of great value.

The patient having been anæsthetised is laid on his back with his thighs fully flexed on the abdomen and a pillow under his pelvis. With the right forefinger in the rectum and the left hand over the front of the abdomen, the right side of the pelvis and abdominal cavity as far as can be reached may now be explored very satisfactorily. The physician then stands on the child's left side and examines with his left forefinger in the rectum and his right hand palpating in front. In this way, besides feeling any enlarged glands or other hard swellings that are present, he may be able to discover any thickening or matting of the intestine that has been left by former inflammatory attacks.

Hernia.—Umbilical hernia is often seen in infants. It

[1] "On the Value of Rectal Exploration as an Aid to Diagnosis in Diseases of Children." *Pediatrics*, June 1st, 1896, p. 481.

is readily recovered from in most cases if the protrusion is kept back constantly for a few weeks or months according to its size; and this is generally easily done by keeping a broad strip of ordinary sticking-plaster over it.

Inguinal hernia of various kinds is common in early childhood; but femoral hernia is practically unknown.

The treatment of hernia, although mainly surgical, has often an important medical side, especially in infants. There is a strong natural tendency for the slighter forms of rupture to be spontaneously recovered from. This, in many cases, is thwarted by constant coughing, crying or vomiting, or by straining either at stool or during micturition, and if these adverse conditions can be removed (*e.g.*, by proper dieting of badly fed infants) more may be done in this way towards the cure of the hernia than would be effected by any amount of care directed only towards the application of a truss. If, however, the crying is due to uneasiness in connection with the rupture, as also sometimes happens, then the adjustment of a well-fitting truss forms the only proper treatment.

THE FÆCES.

The **Meconium** which the infant passes during the first three or four days is of a dark greenish brown colour, of a viscid semi-solid consistence, slightly acid in reaction, and without odour. At birth it is sterile; but within a few hours micro-organisms find their way into it through the anus.

It contains epithelial cells and mucus from the intestine and its colour is due to bile, but the bulk of it is believed to be mainly composed of matter derived from the vernix

caseosa which the infant has swallowed during intra-uterine life along with liquor amnii (Zweifel). This is proved by the fact that meconium always contains hairs and squamous epithelial cells, which must have been derived from the surface of the child's body.

After four or five days the motions cease to contain meconium and assume the characters of normal infantile fæces.

NORMAL FÆCES.

In a healthy breast-fed infant the motions are from two to four in number daily during the first month or two, and usually two or sometimes only one daily after that. They are of an orange yellow colour and of a uniform semi-solid consistence. The reaction is acid and they have a slightly sour but not offensive odour. The stools of a hand-fed infant are similar, provided the food that he is taking resembles breast-milk in composition and is being well digested.

The characters of the motions are readily altered by changes in the feeding. For example, as a considerable proportion of the cream of the milk remains under normal conditions unabsorbed and acts on the bowel as a natural laxative, a defective amount of fat in the food tends to diminish the number of the motions. An increase in the amount of the casein present usually exerts an opposite effect.

The exact shade of yellow colour in normal milk-fæces depends, according to Dr Rotch, largely on the percentage of fat in the milk, being paler if the amount of fat is small. The reaction may become alkaline from changes taking place in the incompletely digested proteids. The addition

of meat preparations, such as beef tea or raw meat juice, to the diet causes the fæces to acquire an offensive odour.

By the end of the first dentition the motions have assumed a brownish colour, and are usually formed.

ABNORMAL FÆCES.

The condition of the motions is frequently of great importance, and information regarding them must always if possible be obtained first-hand, as the statements of the mother and nurse on such matters are often misleading. The attention must be directed, not only to the number of the motions, but also to their condition as to colour, consistence, reaction, odour, size and composition. Abnormalities in the number of the stools will be considered later in dealing with diarrhœa and constipation, but a few remarks may be made with regard to the other points.

The **Colour** is very frequently altered in disease. A green discoloration of the stools is extremely common and of itself has little diagnostic significance. The *green colour* is said to be usually due to an alkaline condition of some part of the alimentary canal (E. Pfeiffer), even when the stools themselves are acid in reaction. In some cases, at least, it is due to chromogenic organisms. Normal motions frequently turn green soon after they have been passed.

Clay-coloured motions are usually due to a diminution in the amount of bile entering the intestine. They are seen in an extreme degree in obstructive jaundice, but are also met with not infrequently without any jaundice, and sometimes continue for weeks in young children without any severe accompanying symptom.

The administration of bismuth produces a *greenish black*



colour in the discharges. Iron also stains them *black*. The darkest stools, however, are those due to the presence of blood.

The soft homogeneous **Consistence** of properly digested milk-fæces is lost as the child's food is varied, and is more or less changed in most forms of dyspepsia. The stools are generally much too liquid in diarrhœa and too solid in constipation. Sometimes, as in summer diarrhœa, the motions are composed of almost pure water, and when this is so the child's condition is generally serious. There is, as Henoch has pointed out, a form of diarrhœa in infants in which part of the motion passed is tolerably normal in consistence and appearance, but this is accompanied or followed by a large amount of fluid which may readily be mistaken for urine. This form of diarrhœa is very exhausting.

The **Reaction** is generally more or less acid and sometimes very markedly so. The watery motions of summer diarrhœa, however, are distinctly alkaline.

The **Odour** of the motions is often greatly increased in disease. When acid fermentation is present they have a sour smell, and often, from decomposition of albuminoid matter, they become extremely putrid and offensive.

The **Size** of the stools is very important. If a very large amount is passed in the day this indicates a great diminution in the absorption of nourishment from the alimentary canal and is usually accompanied by a rapid failure of strength. It is met with in cases where the small intestine is much affected. When the motions although frequent are very small in amount—as is the case when the lower bowel is chiefly involved—the interference with the child's nutrition may be comparatively slight.

The **Composition** of abnormal motions varies greatly in different cases. They may contain not only the remains of the food more or less digested, and also the various other normal constituents of fæces, such as bile, mucus, epithelium and micro-organisms, in altered proportions, but also, in addition, blood, pus, false membrane, internal parasites and their ova, and foreign bodies. They are often frothy from admixture of an abnormal amount of gas.

In some forms of diarrhœa the food, or certain elements of it, may be passed almost entirely undigested. Fragments of undigested curd are generally found when too much casein is being taken; and somewhat similar looking particles, which are composed of unabsorbed fat, are found in other cases. When cod-liver oil is being taken in too large doses, it may be seen and smelled in the motions. When starch is given prematurely, or in too large amount, its presence in the motions may be demonstrated by the use of iodine or by the discovery under the microscope of starch granules.

The **Mucus** which is normally present is very greatly increased in amount in some organic diseases. When its increase is very obvious to the naked eye, it usually indicates disease of the large intestine. Increase in the amount of mucus is not always, however, a sign of organic disease, but also occurs with purely functional disorders, such as lienteric diarrhœa.

Pus is found in the stools in cases of ulceration of the bowel and also in very severe chronic catarrh.

Blood is passed under a great variety of conditions. When pure blood comes from the bowel in a child apart



from diarrhœa or ulceration, it is almost always a symptom of *rectal polypus* and calls for a digital exploration.

In various forms of *diarrhœa*, especially where the lower bowel is affected, or there is *ulceration or fissure of the rectum*, small quantities of blood are often seen in the stools, and in any severe form of diarrhœa the motions may be at times blood-stained. A little bloody mucus is generally passed with straining in cases of *intussusception*.

In new-born children copious hæmorrhage from the stomach and bowel (*melæna neonatorum*) is a very serious affection, which is fortunately rare. The hæmorrhage usually sets in between the second and fifth day after birth, but occasionally later. The motions may contain red blood, but are generally black and tarry. The pathology of the condition is obscure, but in all probability the disease is one of micro-organismal origin, and it has usually nothing to do with hæmophilia.

Hæmorrhage from the bowel is also a usual symptom of congenital obliteration of the bile-ducts and other serious organic diseases of the liver; and occurs rarely in infancy in congenital heart disease, true hæmophilia and purpura.

Spurious melæna, i.e. the passage from the bowel of blood which has been sucked from fissures in the mother's nipple, is much oftener met with than true melæna; and, at all periods of life, the occurrence of epistaxis is a common cause of blood in the motions.

Fragments of **Membrane** are found in the stools in dysentery; and, in the rare instances in which croupous enteritis occurs in children, the motions may be passed covered by a layer of false membrane or pieces of it may be seen among them.

Worms and their ova are also to be looked for.

Bacteria are always present in enormous numbers, and, in cases of cholera and enteric fever especially, their recognition is of importance.

Foreign bodies are sometimes found in the motions. When children acquire the habit of eating earth or some other indigestible substance, this is often first discovered in the stools.

THE BACK.

"In the healthy child," as Mr Owen says,[1] "the chief feature of the spine is its suppleness—the great freedom it possesses in all its varied movements." Even a small degree of *stiffness* therefore is abnormal, and, if present, generally indicates commencing tubercular bone disease. The same significance attaches also to any *pain* on normal movements in bending or turning; and a persistent or recurrent pain in the abdomen, or in either of the lower limbs, should always be regarded as an indication for a thorough examination for spinal caries.



FIG. 25. — Severe Rickety Curvature of Spine in Boy, aged 20 Months.

Rickety curvature of the spine is a very common condition (Fig. 25). In most cases it takes the form of kyphosis, but the curvature differs from that of Pott's disease; *firstly*, in forming a wide curve

[1] On Children's Spines—Healthy, Unhealthy, and Otherwise. *Pediatrics*, March 1st, 1896.

and not an acute angle; *secondly*, in disappearing when traction is made on the legs, except in severe and long standing cases; and *thirdly*, in being unaccompanied by pain or much stiffness.

Cases of paralysis of the muscles of the back are sometimes diagnosed as spine disease. I have known this mistake made in diphtheritic paralysis, in paralysis due to tumour of the cord, and in anterior poliomyelitis.

Lordosis, which results from congenital dislocation of both hips, is often mistaken for an indication of spinal disease. The parents of idiot children are apt to attribute the inability of the children to sit up to disease of the spine.

THE LIMBS.

Careful inspection and palpation of the limbs should never be neglected, because we may often gather from this a considerable amount of useful information regarding the patient's general condition, besides noting any merely local abnormalities.

Thus it should be noted whether the hands and feet are blue and cold, or of a natural colour and temperature, and whether the muscles are small and soft, or large and well developed, also, if the bones are normal in outline, or deformed from rickets or any other disease, and if the joints are swollen or the ligaments abnormally lax.

It is especially important to note any local pain on active or passive movement of the arms or legs, such as is found in syphilitic epiphysitis, and in infantile scurvy.

The presence of clubbed fingers is always important and may help greatly towards the diagnosis of the real nature of

a lesion of the heart or lungs; and the presence of tubercular or syphilitic disease of the phalanges sometimes throws light on an obscure cerebral or abdominal case. Even indications of such apparently trivial facts as that the child habitually bites his nails or sucks his thumb may not be altogether valueless in certain cases.



CHAPTER V.

ON THE EXAMINATION OF THE SKIN.

THE condition of the skin as to colour, moisture and temperature must always be carefully noted, and the presence of any œdema, desquamation or eruption investigated.

COLOUR.

In new-born children the skin is of a more or less deep red colour all over the body. This gradually fades, leaving in many cases a yellow tinge.

Icterus neonatorum.—When this yellow discoloration is marked, it is spoken of as icterus neonatorum or physiological jaundice. It is generally noticed first on the second or third day after birth, and after increasing in depth for a day or two, it gradually diminishes, and is usually gone within a week or ten days.

The explanation of this phenomenon is still obscure. It is certain, however, that it is a form of hepatogenous jaundice and not, as was formerly held by some, hæmatogenous in origin, nor, as others have thought, merely a local discoloration due to the red of the hyperæmic skin turning yellow as a bruise does in the process of fading. It seems probable that at birth a specially large amount of highly pigmented bile is normally secreted, but how

this finds its way into the general circulation is still undetermined.

The discoloration differs from that in ordinary obstructive jaundice both in its distribution and in the order of its appearance. It is first seen on the face and chest, later on the sclerotics, and last of all on the hands and feet. Compared with the skin, the sclerotics are slightly affected and they may remain normal in colour, while in obstructive jaundice they are among the parts earliest and most deeply discoloured. The urine also generally remains quite normal in appearance and the fæces are always so. In other respects the child is perfectly well.

The diagnosis of icterus neonatorum presents no difficulty. The absence of serious symptoms, the slight degree of the jaundice, the normal urine, and the coloured motions suffice to distinguish at once even extreme instances of this condition from cases of septic or catarrhal jaundice and from those which depend on syphilitic or other disease of the liver or on congenital obliteration of the bile ducts.

Cyanosis.—General cyanosis may be a sign of serious disease of the heart or lungs, either congenital or acquired. When it occurs in an acute illness it is of great importance as indicating failure of the heart, or the degree to which the lungs are affected. It is also found in diseases that are characterised by extreme prostration, such as septicæmia and malignant cases of infectious disease. Lividity of the extremities is frequent in wasting diseases of all kinds, and is especially marked in Raynaud's disease. A bluish tinge round the mouth and eyes is a common sign of dyspepsia in young infants.



Pallor.—The peculiar pallid brownish yellow tinge of the skin which is characteristic of splenic disease sometimes occurs distinctly in children, but in many cases where the spleen is much enlarged it is entirely absent. The sallow earthy tint of scorbutic infants is often of great help in diagnosing their condition.

MOISTURE.

Undue perspiration in young children is generally due to rickets. Occasionally it is seen as a symptom of empyema, of tuberculosis, or of simple debility.

An habitually dry harsh skin is a common accompaniment of chronic digestive derangement and occurs in many cases of obstinate diarrhœa; if the skin can be excited to normal action this will help greatly towards the improvement of the bowel condition (E. Smith).

TEMPERATURE.

A cold clammy condition of the extremities is much more frequently found in children than in adults, and when present is an indication not only for the application of warmth locally but usually also for attention to the child's habits as to diet and exercise. The general temperature of the body is of great importance, and to estimate it a thermometer must always be used, as its determination by the application of the hand is unreliable.

Taking the Temperature.—In young infants, as well as in older children, the temperature is best taken in the rectum, but for ordinary purposes, it is more convenient to use the groin or axilla. In young children the groin is preferable; it can be reached with less undressing, and

the child feels less uncomfortable sitting with the thigh bent on the abdomen than he does when the arm is held tightly to the side. The thermometer should not be trusted in the mouth in children under four years old, and even at that age only when the child is intelligent, and is not agitated.

When the temperature is taken in the rectum, the thermometer must be oiled before insertion and should be held in place for three or four minutes. When the groin or axilla is used, care must be taken to make sure that the skin is dry. In either the axilla or groin an ordinary thermometer should remain about ten, and a "half minute" thermometer for five minutes. If the skin in either situation is cold to begin with longer time may be required. In the mouth, five minutes is needed for an ordinary, and at least three for a "half minute" thermometer.

Normal Temperature.—At birth, the infant's temperature is a few points above that of the mother. In the course of a few hours, it falls below normal but soon rises again. During infancy and childhood the normal temperature is usually said to be a little higher than in adult life; but, according to Dr Finlayson,[1] the mean temperature is really about the same, only the daily variations are greater. He says that in a normal child the rectal temperature may vary as much as from 97° to 100° F. in the course of twenty-four hours. In infancy also there is a greater tendency for the temperature to vary both upwards and downwards on slight occasion.

[1] *Keating's Cyclopædia of the Diseases of Children*, Vol. i., article "Diagnosis," p. 98.



Sub-normal Temperature.—During the first three or four months of life there is a great tendency for the temperature to fall below normal. In atrophied babies there is often a constantly sub-normal temperature, and in them a temperature of 98° or 99° F. may therefore indicate the presence of fever. The regular administration of large doses of alkaline medicine causes a distinct lowering of the temperature.

Pyrexia.—Young children are more prone to rise of temperature from slight causes than adults are, and in them a given cause will produce a higher degree of fever. This, according to Dr Donkin, is partly to be explained by the relative dryness of the child's skin in feverish conditions. Emotional causes are very apt to raise a child's temperature. A considerable proportion of children with a normal temperature have some degree of pyrexia during the first night they are in a hospital ward.

Rapid rises of temperature from trivial causes are so common in childhood that pyrexia alone is not a sufficient reason for anxiety. It is only when it is continuous that a high temperature becomes a serious symptom.

When the temperature of a healthy child rises suddenly, the onset of one of the exanthemata or of influenza may be suspected. Careful and repeated examination is to be made for signs of pneumonia. Inspection of the throat is never to be omitted, and otitis is also to be remembered as a possible source of the fever. In many cases the pyrexia will be found to depend on a passing disorder of the stomach or bowel, or to some irritation connected with teething, and under these circumstances an emetic or aperient acts as a rapid antipyretic. Dr Holt has drawn

attention to the fact that a high temperature occurring between the second and fifth day after birth, unaccompanied by other obvious symptoms of illness, is a sign that the infant is obtaining an insufficient amount of nourishment from the breast.

In spite of the utmost care, there are many cases of pyrexia in children which recover without any cause being found.

ŒDEMA.

Marked œdema of the skin generally indicates nephritis. The skin may, however, become œdematous in anæmic and wasted babies quite apart from kidney disease. In older children, a slight amount of œdema of the eyelids and extremities is often found associated with urticaria and without any albuminuria. Occasionally in such cases the œdema is the prominent feature and the rash is scarcely if at all noticeable. Œdema of the eyelids is also often seen in cases of whooping-cough when the spasms are severe (Fig. 40, p. 174). In infantile scurvy, œdema of the eyelids and of the hands and feet is a characteristic occurrence. Œdema of the lower limbs sometimes occurs in severe diarrhœa without kidney disease. The cases in which it is met with are generally severe, but it is not necessarily a fatal sign. Œdema from heart disease is much less common in children than in adults.

DESQUAMATION.

Any peeling of the skin is worthy of attention. If its distribution is general, it will usually arouse suspicion of scarlet fever. If limited to the chest it is often the result



of rubefacient applications or poultices. In infants of a few months, desquamation of the hands and feet is often due to congenital syphilis.

In children suffering from prolonged feverish ailments there is often a general branny desquamation of the epidermis.

ERUPTIONS.

All skin eruptions are to be investigated as to their distribution, the presence of itchiness, the anatomical character of the lesions and their cause.

Distribution.—The precise distribution of the eruption is the first point to be ascertained and this may throw much light on its cause. In early infancy the palms and soles are characteristic sites for syphilitic lesions and also for the eruption of scabies. Eruptions in the neighbourhood of the anus are often due to the irritation of intestinal discharges and are sometimes specific. Other peculiarities in the distribution of congenital syphilitic lesions have already been referred to (p. 53).

In infants on the breast, scabies has the peculiarity of frequently affecting the face owing to its close contact with the mother's breast which is often a seat of the disease. In the same way pediculi pubis sometimes find their way on to an infant's eye-lashes from the mother's axilla. Small patches of herpes on the face or ear are not uncommon in irritated conditions of the teeth and throat.

Itchiness.—This is a common and distressing symptom. It occurs in urticaria, prurigo, eczema, scabies, dermatitis herpetiformis and pediculosis, and is sometimes troublesome also in chicken-pox and in the early stages of measles and scarlet fever. It is usually absent in specific rashes.

Herpes in childhood is seldom if ever accompanied or followed by severe pain.

The Anatomical Characteristics of the Lesions.—In infancy, according to Dr Radcliffe Crocker, skin eruptions "are more likely to take a pustular form, and from the ease with which the alimentary canal is deranged there is a greater tendency to eczema or urticaria." The characteristic lesions of scabies, for example, are often indistinguishable in infants owing to the amount of suppuration it excites.

Causation.—In considering the causation of extensive eruptions in young babies, the possibility of congenital syphilis, scabies and drug eruptions should never be forgotten. The effect in exciting and aggravating skin eruptions exerted by excessive perspiration, washing with strongly alkaline soaps, imperfect drying of the skin after bathing and exposure to cold winds are also important. The influence of teething on eruptions has been already discussed (p. 29). Vaccination, although often unjustly blamed, certainly acts in some cases as an exciting cause of skin eruptions. If performed when a child is suffering from chronic skin eruption it is apt to aggravate the condition, but in rare cases it may have a beneficial effect upon it.



CHAPTER VI.

ON THE URINARY SYSTEM.

KIDNEYS.

At birth and in early childhood, the kidneys are lobulated, and they and the suprarenal bodies are relatively larger than in adult life.

In early infancy tumours in the region of the kidneys are occasionally met with. They are generally of the nature of sarcomata. Congenital hydronephrosis is not very rare, and may be mistaken for a malignant tumour. If, however, as often happens, the swelling is present on both sides, or fluctuation is obtained, there is no difficulty in distinguishing it from a solid growth.

THE BLADDER.

In young children the bladder is situated so high, that it is practically an abdominal, rather than a pelvic organ. Special care must always therefore be taken to see that it is empty before tapping the abdomen.

Micturition.—The infant may pass water soon after birth, as urine is secreted during the later months of intra-uterine life. This is not usually the case, however, and not infrequently no urine is passed during the first twenty-four hours or even longer. During the early months of infancy incontinence is the normal condition.

In the first two years (according to Holt) the child generally passes water as often as twice every hour while awake, and during sleep his urine is retained for from 2 to 6 hours. By the third year the urine may be held during sleep for 8 or 9 hours, and at other times for 2 or 3 hours. Under normal conditions, the intervals between micturition steadily increase as the child grows older. Much depends on the training the children receive. Some infants have acquired a certain control over their bladder by the time they are eighteen months or even a year old. In others, this comes considerably later. If, however, a child cannot control his bladder to a considerable extent, during his waking hours, by the time he has reached his third year he may be regarded as suffering from incontinence.

Retention of Urine. — Retention is not a common symptom in childhood. It may be due to a tight prepuce, a narrow meatus, or a calculus impacted in the urethra. It may also arise from the irritation of thread-worms in the rectum; and it is sometimes met with in enteric fever and in meningitis.

Incontinence of Urine.—Enuresis is exceedingly common, and may arise from various causes. It is a frequent symptom of various severe organic diseases of the nervous system, and also of nocturnal epilepsy. In girls especially, if constant, it may indicate the presence of some local malformation of the bladder or urethra. In the great majority of cases, however, it is a neurosis depending on functional disturbance of the act of micturition, and generally occurs in nervous and emotional children.

Local irritation, such as is caused by phimosis or by thread-worms in the rectum, predisposes to the occurrence



of enuresis, and any influences which tend to cause restless sleep, such as emotional excitement before going to rest, too warm coverings in bed, or the presence of adenoid growths in the naso-pharynx, have a similar effect.

In some cases there is more or less inability to retain the urine during the day as well as at night, and rarely the condition may be altogether or chiefly diurnal. In most cases, however, micturition is normal, or just a little too frequent in the day-time, and the incontinence is nocturnal only. In some cases we have a history of bed-wetting from early infancy, but frequently the child has been normal in this respect for months or years before the enuresis sets in.

Treatment.—The occurrence of involuntary micturition may be due theoretically either to increased irritation or irritability of the bladder, or to diminished tone of the sphincter. We find accordingly that remedies of very different kinds are beneficial in different cases. Which part of the mechanism of micturition is at fault in any case, can often only be diagnosed after the effect of treatment has been observed.

In the majority of cases, more benefit can be obtained from sedatives than from stimulant and tonic remedies alone, and the drug of most value is belladonna. This should be given in large doses, so that at bedtime the pupils are somewhat dilated and the throat dry. For this purpose, 20 to 30 min. of the tincture may be given at bedtime to a child of four or five years old, and for an older child (from six to ten) 30 min. may be given in the afternoon, and the same dose again at night. If not effectual, the dose may be increased gradually up to a

drachm. Sometimes the addition of bromide is useful. When the incontinence ceases, the belladonna should be left off gradually.

In cases where belladonna fails, it is well to try cantharides, either in the form of a blister over the sacrum, or the tincture (one or two minims thrice daily) internally. Liquid extract of ergot (20 mins. thrice daily) is sometimes very effectual, as is also tincture of nux vomica and solution of strychnine In many cases benefit is derived from taking strychnine along with the belladonna.

In addition to the medicinal treatment, care must be taken to discover and remove any preventable causes. The child must not be allowed to drink after 5 or 6 P.M., and he should be roused about 11 or 12 and made to empty his bladder. If the urine is very acid, alkalies may be given. In some cases improvement follows raising the foot of the child's bed. This is supposed to act by diminishing the pressure of the urine on the sensitive area of mucous membrane near the neck of the bladder.

If any source of peripheral irritation exists it should be attended to. Circumcision for phimosis is sometimes followed by an immediate cure of the incontinence. In many cases, however, it has no effect, and occasionally it seems to aggravate the symptoms.

Punishment for bed-wetting has usually only a prejudicial effect especially in young children. If older children can be stimulated, either by hope of reward or otherwise, to desire strongly to recover from the habit there is no doubt that this exerts a considerable effect in favouring their recovery.

Dysuria.— Pain on micturition is often met with in children. In boys it is generally connected with phimosis



or preputial adhesions and disappears when these conditions are treated. There is a painful spasmodic form of dysuria met with in little girls which is sometimes associated with vulvitis and generally with an irritating character of the urine. The child has a constant desire to pass water and screams with pain when she tries to do so. This condition can usually be rapidly relieved by administering hyoscyamus and potash, and giving diluent drinks and a hot hip bath.

Renal Colic.—Renal colic occurs occasionally in infants, especially in those of gouty parents (Gibbons [1]), from the passage of uric acid crystals. It is accompanied by rise of temperature, extreme general tenderness and special pain on pressure over the region of the affected kidney, and retraction of the testicle on the same side. It requires alkaline and dietetic treatment.

THE URINE.

In infants, it is always difficult and troublesome to collect the urine for examination, and many urinary disorders are consequently apt to be overlooked. The amount and colour can be judged of, to a certain extent, by looking at the napkins, and we sometimes also find on them crystals of uric acid which look like sand.

In all cases, however, in which it is important to examine the urine, an endeavour should be made to collect a proper specimen of it. This may be done in several ways. One of these, which is perhaps the least satisfactory, is to leave in contact with the genital organs a clean sponge or piece of absorbent cotton wool which can afterwards be squeezed

[1] "Renal Colic in Infants," *Med. Chir. Soc. Trans. London*, Vol. lxxix., 1896.

out into a glass. In the case of boys, a test tube or small bottle may be fastened in such a position that any urine passed will find its way into it. A useful device, which sometimes succeeds, consists in getting the nurse to waken the child from sleep, and at the same time to exert steady pressure over the bladder. If other means fail, a soft catheter should be used to draw off the water.

Quantity.—The daily quantity of the urine in children varies considerably in different individuals, and also on different days, according to the amount of fluid taken and the quantity got rid of by the skin and bowels. The following table of the average amounts passed at different ages is given by Holt:—

Average daily quantity of Urine in Health.

	Ounces.
First twenty-four hours	0 to 2
Second twenty-four hours	½ ,, 3
Three to six days	3 ,, 8
Seven days to two months	5 ,, 13
Two to six months	7 ,, 16
Six months to two years	8 ,, 20
Two to five years	16 ,, 26
Five to eight years	20 ,, 40
Eight to fourteen years	32 ,, 48

Polyuria (diabetes insipidus) occasionally occurs even in young children, and runs a similar course to that observed in older patients.

Urea.—The daily amount of urea passed amounts in children from three to five years old to 13 or 14 grammes, and in those from five to thirteen years, to from 16 to 21 grammes (Holt).

Uric Acid.—The proportion of uric acid in the urine is



much greater in new-born children than at any later period of life, and their kidneys always show an accumulation of crystals (uric acid infarcts) in the straight tubules. These crystals are usually washed out within the first few weeks of birth; and may be seen on the infant's napkins; their passage is occasionally the cause of dysuria.

Albuminuria.—During the first ten days of life albumin is occasionally present in normal conditions, and this is attributed to the irritation produced by the passage of uric acid crystals. When found in older infants apart from the presence of pus or blood it is usually due to nephritis. It may be produced by the application of tarry preparations or carbolic acid to the skin, or by the use of large doses of certain drugs, such as chlorate of potash. Albuminuria is not infrequently found in severe cases of diarrhœa and in any form of septic poisoning. It is also apt to occur in cases of general eczema.

When evidence of nephritis is present careful inquiry should always be made to ascertain whether it is possibly scarlatinal. The skin must therefore be inspected for traces of desquamation and the throat and its glands examined, and possible sources of infection investigated. Cyclic albuminuria, although commonest between ten and sixteen years, is sometimes met with in younger children. Its diagnosis from chronic nephritis is often difficult.

Hæmaturia.—Blood may be found in the urine in many different conditions. It is an important symptom of renal tumour, of nephritis and of acute cystitis. It is one of the early indications of the presence of infantile scurvy. In these cases it is at first only found on microscopical examination, but later it may be very profuse, and numerous

blood casts may be found. It occurs also sometimes in purpura, in vesical calculus and in genito-urinary tuberculosis.

Pyuria.—The presence of pus in the urine may be due to cystitis, which occurs most frequently in female infants, and is generally associated with acid urine. It is also a symptom of pyelitis, which may occur even in small babies, and runs a protracted course with a high and remittent temperature.

Glycosuria.—Sugar is rarely found in the urine in children, and when it occurs to any high degree it is always of the gravest significance.



CHAPTER VII.

ON THE EXAMINATION OF THE HEART AND ON HEART DISEASE IN CHILDREN.

The Pulse.—The *pulse rate* varies in children, according to their sex, age, &c. At birth, it ranges between 120 and 140 per minute. The following may be regarded as the average pulse rate in healthy children during sleep or perfect quiet:—

6 to 12 months . . .	115-105.
2 to 6 years	105-90.
11 to 14 years	85-75.

The pulse will often be quickened, as much as 20 or 30 beats in the minute, by mental emotion or bodily exercise, hence the great importance of counting it when the child is asleep or quiet.

Irregularity of the pulse with normal or increased frequency is not uncommon in childhood — especially during sleep — and is generally of no importance. If, however, the pulse is both slow and irregular it is always worthy of careful attention. A slow and irregular pulse is met with not infrequently in children during convalescence from infectious diseases. Under these circumstances it is of no serious significance, except perhaps occasionally in influenza or diphtheria in older children. If, however, it is met with apart from previous acute illness, especially if

there are along with it any other cerebral symptoms, it may be an ominous sign, as it often indicates the onset of tubercular meningitis.

Inspection and Palpation of the Præcordia.—In cases of hypertrophy of the heart in children there is often considerable bulging of the soft chest-wall, and any abnormal pulsations are readily visible. The position of the apex-beat, however, is often difficult to fix without palpation. Epigastric pulsation and visible pulsation in the vessels of the neck are always important.

The *apex-beat* in children under four years is generally outside the nipple-line, and is usually in the fourth instead of the fifth intercostal space. The heart occupies a more horizontal position in infancy than it does in later life, but as the child grows older the apex-beat gradually comes to assume the adult position. In palpating the apex-beat in heart disease it is important to observe not only whether it is displaced but also whether it is forcible as in hypertrophy of the heart, or feeble as in dilatation; and if it is well defined as in hypertrophy of the left ventricle, or diffuse as in hypertrophy of the right ventricle. *Thrills* are very clearly felt in children and are often important in differential diagnosis.

Percussion. The area of the deep as well as of the superficial dulness of the heart is relatively larger in children than in adults.

Auscultation.—The normal heart-sounds in little children are peculiar in certain ways. The first sound is louder than the second in all the areas, so that even over the base of the heart their rhythm is trochaic and not iambic as in adults. This is attributed to the fact that the arteries have



a relatively larger calibre in childhood and the arterial tension is consequently lower.

The pulmonary second sound over the base is normally louder than the aortic. We have to judge, therefore, of the strength of the pulmonary second sound by comparing it with the first sound in the same area; and if the second is constantly the louder of the two sounds there, it is to be regarded as accentuated (Hochsinger[1]). To settle this question, however, the heart must be auscultated when the child is not frightened, because emotional disturbance causes a temporary accentuation of the pulmonary second sound. The heart sounds are heard more distinctly all over the thorax in young children than in adults. This is owing to the favourable conditions for conduction offered even in health by the child's thorax.

Murmurs may be *functional* in origin, or they may arise from acquired valvular defects or from congenital malformation of the heart. When the heart is going very rapidly at the time of examination, it may be almost impossible to make sure of the presence of murmurs even when they are quite loud at other times.

Functional murmurs are certainly much less common in children than in adults. They do occur, however, occasionally even in young children. When anæmic basic murmurs are loud, an erroneous diagnosis of congenital cardiac malformation may be made.

CONGENITAL HEART DISEASE.

Congenital malformation of the heart may be due to the persistence of fœtal conditions which ought to have ceased

[1] *Die Auscultation des kindlichen Herzens*, Wien, 1890.

soon after birth (*e.g.* patent ductus arteriosus or foramen ovale). It may also be caused by some earlier interference with development, leading to absence of one of the large blood vessels, or of one of the principal orifices, or to the transposition of vessels, &c.; or it may be the result of fœtal endocarditis.

Symptoms.—The main symptoms by which we recognise the presence of congenital heart disease are of three kinds: (1) Cyanosis, and clubbing of the finger-ends; (2) certain murmurs and variations in the loudness of some of the heart sounds; (3) alterations in the size and shape of the heart.

Cyanosis is frequently absent in congenital heart cases. When present, however, it is an important symptom, because it is never due in young children to acquired heart disease and only rarely so in older children. The same is true of *clubbing of the finger ends.*

The *murmurs* due to congenital heart disease are almost always systolic and are generally loud unless the heart is acting feebly. Their situation varies very much. Occasionally marked malformations exist without producing any murmur at all. In rare cases the character of the murmurs varies somewhat at different times.

The heart may be greatly *enlarged* or it may be altered in shape from hypertrophy of certain parts. In many cases, however, no change in its conformation can be discovered.

Diagnosis.—The diagnosis of the exact lesion in cases of congenital heart disease will always be an interesting question. In the large majority of cases, however, it is one which must remain unanswered owing to its extreme difficulty; and, even when the lesion can be ascertained, its



diagnosis is rarely of any importance in settling the prognosis and treatment.

What is of real importance is to settle, *firstly*, whether the lesion is a congenital or an acquired one (and this is usually tolerably easy in young children), and, *secondly*, to ascertain from the general symptoms, the degree to which it is interfering with the heart in the efficient performance of its functions.

The importance of cyanosis in determining the congenital nature of a heart case has been already referred to. Hochsinger's[1] views with regard to the diagnosis by auscultation are very useful. They are founded on observation of children under five years old. After that age the diagnosis becomes increasingly difficult, owing partly to the great frequency of secondary endocarditis of the congenitally abnormal structures. His conclusions are (slightly abridged) as follows:—

1. Loud harsh musical murmurs with a normal or but slightly increased area of dulness are met with, in little children, only in congenital cases. When acquired inflammatory heart affections occur in them with very loud murmurs they invariably cause great increase in the cardiac dulness.

2. The occurrence of murmurs along with greatly increased cardiac dulness and feeble apex-beat in young children is in favour of congenital disease. The increased dulness depends mainly on the right heart while the left is but slightly altered. On the other hand, acquired heart disease in children is accompanied by increased force of

[1] "Ueber Diagnostik angeborener Herzfehler bei Kindern," *Wiener Klinik*. Feb. 1891.

the apex-beat, because its effect falls first on the left side while the dilatation of the right heart sets in later and does not affect the increased strength of the apex-beat.

3. The complete absence of murmurs at the apex, while they are distinctly present in the region of the auricles and over the pulmonary orifice, is always an important element in the differential diagnosis, and is more in favour of septal defects or pulmonary stenosis than of endocarditis.

4. Abnormal weakness of the pulmonary second sound, along with a distinct systolic murmur, can only be explained in early childhood, by assuming the presence of congenital pulmonary stenosis, and consequently is worth remembering as a point in the differential diagnosis.

5. Absence of a palpable thrill, in spite of very loud murmurs audible all over the præcordial region, occurs almost exclusively in cases of congenital septal defects, and this condition is therefore against a diagnosis of acquired heart disease.

6. Loud, especially humming, systolic murmurs with the point of maximum intensity situated over the upper third of the sternum and without any symptom of marked hypertrophy of the left ventricle, are very important for the diagnosis of persistence of the ductus arteriosus and cannot be explained by the assumption of endocarditis of the aortic valves.

Prognosis.—The prognosis depends largely on the state of the child's development and on his general vigour, also on the presence or absence of hypertrophy of the heart and cyanosis, and little on the character of the murmur. Thus, on the one hand, if a child has lived several years with a congenital heart lesion and his nutrition and vigour have



been tolerably well sustained, if cyanosis and finger-clubbing are absent and the heart little, if at all, hypertrophied, the prognosis as to his reaching manhood may be fairly good. On the other hand if the cyanosis is marked, the child weakly and the heart enlarging in spite of care, the prognosis is very bad.

Remember, however, in estimating the effect of a congenital heart lesion on the general health not to attribute to its influence debility arising from other causes. I have more than once seen children with congenital heart disease who were supposed to be dying from it but whose alarming symptoms arose mainly, if not altogether, from severe rickets or some other diet-disorder, and who rapidly recovered strength under ordinary treatment.

Treatment.—The treatment consists mainly in keeping the child warm and attending to his nourishment. For the cyanosis and general symptoms digitalis is of no use, but in some cases it is occasionally of value when there are signs of failure of compensation.

ACQUIRED HEART DISEASE.

Endocarditis may occur at any age. It is however comparatively rare in children under three. It may affect any of the valves, but in the great majority of cases it is the mitral which suffers.

Symptoms.—The physical signs of endocarditis in children do not differ essentially from those in later life, but hypertrophy and dilatation occur more readily and more rapidly than in adults. The general symptoms of valvular heart disease which are usually noticed in young children are

pallor, a short dry cough, breathlessness on exertion, palpitation and marked emaciation. As Dr Goodhart says, "heart disease in children is a wasting disease." Even in severe cases of valvular disease it is rare in childhood to meet with the great œdema of the limbs, enlargement of the liver and spleen, dyspnœa and cyanosis which are so commonly seen in the adult in advanced cardiac disease.

Causes.—Heart disease in children may arise from many causes, some of which are obscure in origin. The great majority of cases, however, are due to rheumatism, and the most practical question which has to be settled with regard to the etiology of any case is whether it is or is not rheumatic. This question is an important one because, if the lesion is rheumatic, it throws light on the child's tendency to disease and indicates much with regard to his future treatment.

Diagnosis of Rheumatism.—The absolute diagnosis of rheumatism must depend on the presence of one or more other manifestations of that disease in the patient, or on the past history of their having been present. If arthritis of one or more joints exists, that is usually held to be sufficient to settle the question; and the presence of erythema circinatum or of choreic movements has practically the same significance. The most satisfactory proof, however, of the presence of rheumatism is the finding of **rheumatic nodules.**

These are little nodules of white fibrous tissue varying from the size of a pin's head to that of a pea (or even larger), which are to be looked for over the bony prominences of the knee and elbow and elsewhere (Fig. 26).

They appear in crops, lasting usually a few weeks (in rare cases for many months), and then quite disappear. The skin over them is not reddened and is not adherent to them. They are usually, however, somewhat attached to the periosteum or tendon-sheath over which they lie. They are not at all painful or tender to touch except when they are growing rapidly in tense structures as on the scalp, or have been irritated by pressure.



FIG. 26.—Rheumatic Nodules over the Patellæ.

Generally only a few nodules are found at a time, usually on the elbows, knees or ankles; but occasionally they are present in large numbers, growing not only about all the bony prominences of the limbs, over the vertebral spine and under the scalp, but also on the ribs, clavicles, iliac crests, &c., on the prominent tendons of the extremities, and the fasciæ of the erector spinæ and abdominal muscles; and even, rarely, on the rim of the ears. When present, they are easily found if carefully looked for, and if the skin be moved over them in a good light they are even more easily seen than felt. Their discovery is a matter of importance, because they not only indicate the presence of rheumatism but show that the disease is present in an active and progressive form and that careful precautions against cold

should at once be taken—that the child in short should be put to bed and watched.[1]

Treatment.—If a child has shown any distinctively rheumatic manifestations, he must in future be guarded with especial care against cold and damp; and, on the appearance of even slight joint-pains, he must be put to bed between blankets. The treatment of valvular disease of the heart in children does not differ essentially from that in adults. The main thing in the early stages is prolonged rest, and its importance can hardly be over-estimated.

Pericarditis.—In young children (under four years) pericarditis is rare and generally occurs as a complication of empyema or pneumonia.

In older children it is met with most frequently as a manifestation of rheumatism. In this disease it runs generally—although not always—a subacute progressive course with little or no fluid effusion; and it is usually found in children who have already suffered from some other rheumatic manifestation.

Occasionally severe pericarditis sets in suddenly in children, apart from rheumatism, as a primary disease. In these cases it may cause only a slight præcordial uneasiness with some rise of temperature, and it is therefore very apt to be overlooked. It may also occur in the course of tuberculosis, septicæmia, scarlet fever, and nephritis.

[1] "On Subcutaneous Nodules connected with the Fibrous Structures occurring in children the subjects of Rheumatism and Chorea," by Thomas Barlow, M.D., and Francis Warner, M.D. *Trans. Internat. Med. Congress*, London, 1881; and "*The Rheumatic State in Childhood*," by W. B. Cheadle, M.D., London, 1889.



CHAPTER VIII.

ON THE EXAMINATION OF THE LUNGS AND ON RESPIRATORY DISEASE IN CHILDHOOD.

INSPECTION.

INSPECTION determines (1) the form of the chest and (2) its movements.

Form of the Chest.—The normal infant's chest differs considerably in shape from the adult's. It is more cylindrical in form, and its section is consequently more nearly circular in outline. The outline is readily altered by any disease that tends to soften the already soft chest wall, or to interfere with the free expansion of one or both lungs. The commonest alteration which we meet with, is the deformity due to rickets, but we also find various degrees of pigeon-breast, and occasionally, as in adults, unilateral retraction or distention, due to pulmonary or pleural disease or to spinal curvature.

The **rickety thorax** is chiefly characterised by beading of the ribs, and by its peculiar shape (Fig. 47, p. 290). The *beading* or so-called rosary is situated at the junction of the cartilaginous and osseous portions of the ribs, and is due to an overgrowth of cartilage. It is generally easily visible (Fig. 46, p. 290), but in slighter cases, and in fat children, it is only to be made out on palpation. In all

cases the swellings project more on the pleural side of the chest wall than outside. The first and second ribs are the least affected, while the largest beads are found on the fifth and sixth—that is on those with the widest range of movement.

Comparatively rarely, and generally only in severe cases, we find *posterior beads* on one or other side of the back of the chest (Fig. 49, p. 292). These swellings are asymmetrical in position, and their pathology is quite different from that of the ordinary rickety rosary. They are composed of callus which has formed round green-stick fractures of the ribs, caused usually by lateral compression of the chest in lifting the child. Similar lesions of the clavicles, caused by lifting the child by his upper arms, are occasionally met with.

As the thoracic wall is abnormally soft and yielding along the line of the beading, it becomes indrawn in this position, causing parallel grooves in front of and behind the rosary. There is usually also a transverse groove running horizontally across at the level of the upper end of the xiphisternum.

When the chest is severely affected (Fig. 47, p. 290), it has a peculiar shape, owing to the deepness of the hollowing out along the line of the costo-chondroid joinings. This results in the sternum and costal cartilages being pushed forwards as a bulging rounded projection, while the horizontal outline of the thorax assumes a form that somewhat resembles a violin.

The deformity known as **pigeon-breast**, is met with sometimes in young infants, but more frequently in older children. In it the abnormal projection is more pointed,



so that its horizontal outline is almost triangular. In infancy, it is occasionally seen in congenital atelectasis, in bronchitis with collapse, in congenital laryngeal stridor, and in other forms of disease, where there is long continued or frequently repeated interference with the entrance of air into the lungs. It may develop in a perfectly well-formed chest, during a severe attack of whooping-cough. When present in older children, there is almost invariably a history of recurrent bronchitis, and not infrequently evidence of the presence of adenoid growths in the naso-pharynx.

There may also be marked contraction of one side of the chest from old pleurisy or collapse, or evident bulging of the left half of the thorax in front, from a hypertrophied heart. Noticeable enlargement of the superficial veins over the upper part of the chest, is a common symptom of enlarged bronchial glands.

Movements of the Chest.—(*a*) *Character of the respiratory movements.* The respiratory movements of the chest are slight in infants, because the type of respiration in them is almost entirely abdominal. It is important to notice not only if the two sides move equally, but also if there is any indrawing of the epigastrium and adjacent parts on inspiration. Such indrawing indicates that sufficient air is not entering the chest. The significance of the fact varies according to the circumstances under which it is met with. Thus, in extreme rickets, it may be merely due to the abnormally collapsable character of the chest wall, and indicate no urgent risk. With a tolerably normal chest, however, retraction of this part of the chest wall becomes a symptom of serious importance. When it is met with in broncho-pneumonia, its amount helps us to gauge the

extent to which the lung is affected, while in croup its presence to any marked degree is one of the main indications for immediate tracheotomy.

In watching the respiration, it is well to note if the normal bulging of the upper part of the abdomen occurs with each breath. If instead of this there is sinking in of this region with inspiration, this is probably due to paralysis of the diaphragm—a dangerous condition generally caused by diphtheritic paralysis.

The movements of the alæ nasi should also be noted. In any case of dyspnœa from a serious organic disease (such as pneumonia or croup) these are greatly exaggerated, and if, with stridulous or rapid breathing, there is no increased action of the alæ it is a somewhat reassuring sign. When there is severe dyspnœa in infants our attention may be called to the fact that they cease to be able to take the breast owing to the difficulty they have in holding their breath while sucking.

(*b*) *Rate of the respiration.*—In young infants the breathing is very variable, and it is difficult therefore to estimate it correctly. It is best counted during sleep, and we should take the average of several minutes. At birth, the number of respirations per minute varies from 32 to 50, and during the first year from 25 to 35. During the second, third and fourth years, it is about 25 per minute. In children of seven or eight, the rate is still higher than in adults. Like that of the pulse, the rate of the respiration varies greatly, not only with the body temperature but also with the mental state.

The important part, however, to determine about the breathing is not its actual rate so much as the ratio between



it and the pulse rate. The *pulse-respiration ratio* should in health be 1 to $3\frac{1}{2}$ or 4; and any great disturbance of these proportions is of clinical significance. A markedly increased rate of breathing accompanied by dyspnœa signifies pulmonary disease and is often of great use in the diagnosis of early cases. There are, however, certain fallacies which have to be guarded against. Thus, increased rapidity of breathing may occur without pulmonary disease in children who have extremely rickety chests or in whom there is great abdominal distention. Some children also, as Henoch has pointed out, during the state of nervous irritability accompanying teething have a respiration rate of 60 to 90 per minute without any adequate local cause; but, in those cases, there is no severe respiratory distress.

EXTRA-AUSCULTATION.

A good deal can be made out about the state of a child's respiratory passages by listening to his breathing, his cry, and his cough.

(1) **The Breathing.**—There are various kinds of noisy breathing.

Snuffling breathing indicates some obstruction of the nasal passages. It often occurs in young infants from ordinary catarrh, to which they are very liable. When, however, it persists for a long period, or occurs apart from other catarrhal symptoms, it always suggests the presence of syphilis. "Snuffles" is one of the most constant symptoms of congenital syphilis and usually appears before the rash. Sometimes it is very slight in degree, and it may be inaudible unless the child's mouth is closed.

In cases of bronchitis and pneumonia the presence of nasal obstruction from any cause constitutes a serious complication.

Snoring during sleep, with noisy breathing while awake, and a nasal tone of voice, commonly indicate the presence of enlarged tonsils or adenoids; but in rare cases may be due to diphtheritic paralysis of the palate. *Noisy breathing with dyspnœa* chiefly during inspiration and a cry which is nasal but not generally hoarse, is characteristic of retro-pharyngeal abscess, and calls for an immediate digital examination of the pharynx.

Deep *sighing* occasionally occurs in little children without meaning much, but it is also one of the symptoms met with in the prodromal stage of tubercular meningitis.

Laryngeal or stridulous breathing indicates either organic or spasmodic narrowing of the wind-pipe and is met with in true and false croup, and in other forms of laryngeal obstruction (*e.g.*, polypi). In young babies it is most frequently due to congenital laryngeal stridor (infantile respiratory spasm), a condition which is probably mainly a functional neurosis, although its pathology is not yet determined. It begins at or soon after birth and is recovered from in the course of natural development during the second year.

Bronchial wheezing is often readily audible not only in regular asthma but also in many cases of bronchitis of the larger tubes.

(2) **The Cry.**—Much may sometimes be learned from the child's cry. It is of course a natural thing for a baby to cry loudly when in pain or if annoyed, and if he does not do so there is something wrong. From the loudness



of an infant's cry we can gauge his strength to a certain extent; and if he cries loud and long, we may be sure that he has no serious acute condition of his respiratory passages. Thus, if a child with dulness over part of the chest cries loudly, this is a point strongly in favour of his having pleural effusion rather than pulmonary disease.

It is also important to notice whether the cry is normally clear, or hoarse and laryngeal. A laryngeal cry in young infants is generally a symptom of congenital syphilis.

The Cough.—The cough varies much in significance and in character. The presence of a cough may indicate a morbid condition in the ear, brain, heart, stomach or other parts, and it is quite as often a sign of irritation about the pharynx and its neighbourhood as of disease further down in the respiratory tract. Its character is important. It is *loud and clanging* at the beginning of an attack of croup, and husky and stridulous at a later stage. In bronchitis it is often *deep and harsh.* In pneumonia with accompanying pleurisy, it is *suppressed and painful.* If a child coughs loudly without wincing, you may be sure that he has not got acute pleurisy. When a child suffers from a loud noisy cough on lying down at night and also when he awakes in the morning, although he is not much troubled during the day, he will probably be found to have a catarrhal condition of his throat with or without dyspepsia.

Often the cough has a distinctly *paroxysmal* character. This is most marked in whooping-cough, but is also heard to a less degree in severe bronchitis, and a similar cough is characteristic of empyema and of enlarged bronchial glands. If a child has a cough which is worst at night,

occurs in paroxysms and often ends in vomiting, this almost certainly indicates whooping-cough.

SPUTUM.

It is only when children are between five and seven years old that they begin to expectorate naturally. Before that age they generally swallow the sputum. If it is important to examine it, it should be taken from the back of the throat with a swab. Real *hæmoptysis* is comparatively rare in childhood. It does not occur, as in adults, as an early symptom of pulmonary phthisis, and is only rarely met with in the late stage of that disease. When a young child spits up blood it is generally owing to the violence of the cough, as in pertussis, and it often comes from the throat, nose or gums.

PALPATION.

In examining the lungs it is important to ascertain at an early stage the position of the *heart's apex-beat.* Should this be found displaced to one or other side, as often happens in pleurisy with effusion, in collapse of the lung and in fibroid disease, it may at once throw considerable light on the diagnosis and shorten the subsequent examination.

In cases of acute lung disease, the state of the heart, as to strength or weakness or dilatation of its right side, is often more important from the point of view of prognosis and treatment than is the exact state of the lung.

Vocal fremitus is often difficult to obtain in children, owing to the quality of the child's voice, and to his unwillingness to speak loud. Sometimes it may be got when



he is crying. While we can never count on getting it, it is often of great help when obtained. Rhonchal fremitus is very easily observed in many cases of bronchitis.

AUSCULTATION.

If little children are frightened, they sometimes hold their breath when you try to auscultate them and will not inspire freely. This may delay our examination, but from another point of view is reassuring, as it proves that there is no serious lung disease.

Crying is of course a common interruption to auscultation. It is not, however, nearly so troublesome as might at first sight appear. Crying makes the child take long deep breaths, and therefore causes any accompaniment that there may be to be more clearly audible. Similarly, the auscultation of the heart may sometimes be carried out fairly satisfactorily when the child is crying—provided always that the crying is vigorous—because in the pause between the cries, there is time for one or two cardiac revolutions to take place. Should the crying be of the nature of whimpering or suppressed sobbing, the interference which it causes to auscultation is much greater.

The child's chest has great powers of conduction, so that one hears the heart sounds at the back comparatively well without any consolidation of the lungs being present, and crepitations which are produced in one lung may be heard clearly on both sides.

The *breath sounds* in young babies are naturally very weak, owing to the feeble shallow nature of the breathing. As the child grows they get gradually stronger, and about

the age of six months they acquire the peculiar harsh character known as *puerile.*

In older children, *abnormal weakness* of the breath sounds is an important sign. We meet with it in the early stages of pneumonia, in pleuritic effusion, in collapse of the lung and in pneumothorax. If, on auscultation, the breath sounds are found to differ in loudness on the two sides, the side with the weaker breathing is almost invariably the abnormal one. Areas of weak breathing which pass off rapidly are sometimes found in children, due apparently to temporary collapse of a portion of lung from blocking of the bronchus with mucus.

Tubular breathing is more often met with in pleurisy with effusion, in children, than in adults, and it sometimes leads to a mistaken diagnosis of consolidation. In pleurisy in young babies we sometimes fail altogether to find *friction* sounds. In such cases we have to depend on the catch in the breath and evident accompanying pain which we observe when the child inspires deeply or attempts to cry.

A peculiar alteration of the rhythm of the breathing is frequently met with in children and is sometimes perplexing to beginners. In ordinary respiration we have inspiration followed by expiration; then a pause; then inspiration again, and so on. In the peculiar breathing referred to, there is first a long loud expiration, the noise of which sometimes amounts to a sort of grunt. This is followed immediately by a short inspiration; then there is a pause; then expiration begins again, and so on. This peculiar breathing with *expiratory rhythm* is heard in its most marked degree in commencing pneumonia. A certain



degree of it, however, is often observed in little children with perfectly healthy lungs—especially if they are apprehensive or frightened.

Vocal resonance often cannot be obtained in the usual way by making the child speak, but the cough or the cry may be sufficient.

PERCUSSION.

In order not to hurt or frighten the child, percussion should always be light; strong percussion is apt to mislead by bringing out dulness or resonance, as the case may be, from underlying organs. It is essential *to see that the patient is sitting straight*, because even a slight twist of the spine may give rise to distinct differences of percussion-note on the two sides of the chest. Marked alteration of note may be produced by variations in the curve of the chest wall; so that in a deformed chest local impairment of the percussion-note may be found which is not due to any change in the lung but merely to a sharper curve of the ribs.

Slight areas of dulness may be due to small pieces of collapsed lung, or to the result of old pleurisies. In any case, a slight amount of impairment, apart from any other sign or symptom, is not in children to be regarded very seriously. On the other hand, even when fluid is present in the pleura there is often less absolute dulness in children than might be expected; and sometimes patches of consolidated lung give very little dulness, owing to their being surrounded by emphysema. Dulness over the manubrium sterni, and extending to either side of it for some distance, is one of the signs of enlarged bronchial glands. Owing

to the yielding nature of the chest walls, a well-marked *cracked-pot sound* can often be obtained in little children who have perfectly healthy lungs—especially when they are crying.

THE PECULIARITIES OF RESPIRATORY DISEASE IN CHILDREN.

BRONCHIAL CATARRH.

Bronchial catarrh is extremely common in infants and young children, and is important, not only for this reason, but also because it is so liable in them to be complicated by collapse and broncho-pneumonia.

Causes.—Cold and damp are generally the *exciting causes* of bronchitis in children; and injudicious clothing and exposure are often to blame for it. In examining infants, therefore, we must always remember their great liability to suffer from chills, and we should not expose much of the surface of the body at a time, except in a warm room or in front of a good fire.

In many cases there are also important *predisposing causes* at work, and these have to be taken into account in the treatment. Rickets strongly favours the occurrence of bronchial as well as other forms of catarrh, and when we have bronchitis lasting long or frequently recurring, we often find that it is due to the presence of this disease. In such cases, the regulation of the diet, and other anti-rachitic measures, are of more importance in the treatment than cough-mixtures, and other remedies directed against the local malady; and some combination should always be used.



Even in children who are not rickety, the presence of teething seems sometimes to predispose to bronchitis, and the advent of each new group of teeth is accompanied by an attack. Another important predisposing cause of recurrent bronchial attacks is the presence of adenoid growths in the naso-pharynx and, as Lockhart Gibson and others have pointed out, the removal of these is often followed by comparative immunity from further recurrence of the bronchitis.

Symptoms.—The symptoms of bronchitis as it occurs in children, vary in severity not only with the size of the bronchi affected but also with the strength of the patient. In wasted and weakly infants the symptoms are less severe, although the real danger is much greater, than in those who are robust. If the child's cough, and especially if his cry is loud, the case is not yet a serious one.

Treatment.—In treating a baby with acute bronchitis there are two main indications. *Firstly*, the strength must be sustained, and depressing influences guarded against. The room should be kept at an even temperature of 65°-70° F., and all draughts carefully avoided. The diet must be as nourishing and digestible as possible, and if the baby is refusing food, or if the case is a severe one, stimulants may be advisable—alcohol, ammonia, digitalis and strychnine.

Secondly, the patient must be assisted to get rid of the excessive bronchial secretion which constitutes an element of danger to him, by the secretion being rendered more flnid and the natural methods of its expulsion aided. This indication may be fulfilled in various ways:—

(*a*) The air he breathes should be moistened by having a steam-kettle playing close to his bed, or by hanging up

near it from time to time ordinary towels wrung out of hot water.

(*b*) Hot fomentations may be applied to the chest if the case is acute, or perhaps better, a mustard poultice followed by a cotton-wool jacket; or a stimulant embrocation (F. 3) may be applied.

(*c*) In the early stages small doses of ipecacuanha wine should be given with an alkali. Later, such stimulant expectorants as carbonate of ammonia and squills are indicated, and a sedative may sometimes be added with advantage (F. 4-6).

(*d*) When, in a strong child, the secretion is copious and the patient is not vomiting spontaneously, an occasional emetic is of great advantage and generally gives marked relief. If the baby can be made to vomit by tickling his fauces with a feather, this is sometimes better than giving an emetic.

(*e*) The baby's clothes must be warm, and should not be so tight as to interfere with the full play of his chest in breathing and coughing.

BRONCHO-PNEUMONIA.

Broncho-pneumonia is a complication, or rather culmination of bronchitis which we always dread in young children, and the weaker the patient is, the more likely is it to set in. It is the form of pneumonia which is commonest during the first years of life; and, as Holt says, it is rarely met with after four years of age, except as a complication of one of the infectious diseases. Its onset is indicated by the loud harsh cough of bronchitis becoming shallow, short and



hacking, and either more frequent or much less so. At the same time the respiration becomes much quicker, and the pulse is also accelerated though to a less degree. The temperature rises and assumes a remittent type.

There is increased dyspnœa with inspiratory retraction of the lower segment of the chest wall; and after a time over one or more areas there is bronchial breathing, characteristic sharp râles, and an impaired percussion-note.

The treatment is substantially the same as that of bronchitis, but the importance of sustaining the strength becomes even greater when the lung is affected.

COLLAPSE OF THE LUNG.

Collapse of the lung is a very frequent and important incident in the course of all kinds of respiratory disease in infancy. It is also frequently found after death in those who have died from debilitating disease of any kind, although they may have had no pulmonary symptoms.

Causes.—The special tendency to the occurrence of collapse in young children is explained, partly by the soft and yielding chest walls and weak respiratory muscles, and partly by the fact that coughing in them is largely a reflex act, and is not aided, as in adults, by experienced voluntary efforts at expectoration. With these unfavourable conditions present, a smaller amount of bronchial secretion is sufficient to obstruct seriously the free entrance of air into the vesicles, and narrowing of the upper air-passages, such as occurs from adenoids, is more apt to have a deleterious effect on the lung expansion. The occurrence

of abdominal distention from tympanites or any other cause is another element frequently present in childhood. Areas of pulmonary collapse may become reinflated with air, with or without treatment. If not reinflated, they are apt to become the seat of catarrhal inflammation.

Symptoms.—The symptoms of collapse vary according to the amount of lung involved. If a large area is suddenly affected in this way in the course of an attack of bronchitis, the respiration becomes very rapid, rising perhaps to 70-90 in the minute, the alæ nasi work violently, cyanosis appears and the child is greatly distressed. The cough is less loud and harsh than previously, and the child shows signs of exhaustion. The temperature does not rise as in pneumonia and may even fall.

The physical signs also change. The lower part of the thorax and the interspaces over the affected area are indrawn with each inspiration. The breath sounds are feeble and distant, and tend to become bronchial in character. In many cases it is impossible to diagnose collapse of the lung with certainty during life, but it may often be advisable to employ suitable treatment for it before it can be diagnosed with absolute certainty.

Treatment.—In treating a case of pulmonary collapse, we aim at the re-inflation of the collapsed areas. To this end we endeavour to remove all impediments to the breathing, we try to increase the force of the inspirations as well as the child's general vigour, and at the same time we aim at diminishing the viscidity of the secretions and lessening the spasm of the bronchial walls.

The child should lie with the affected side uppermost, and his clothes should be light and lie loosely on the chest



and abdomen. He should not be allowed to sleep long and soundly, but should be wakened from time to time and made to cry. The strength of his crying may be increased by the sudden application of cold clothes to his chest or by rubbing it with a stimulating liniment (F. 7). Easily absorbable nourishment, along with alcohol, ether, ammonia, strychnine, &c., should be given to sustain the general strength. To liquify the secretion a steam-kettle and the administration of ipecacuanha and alkalies will be useful, and belladonna may be given in full doses for the relief of spasm.

CROUPOUS PNEUMONIA.

Croupous pneumonia may occur at any age, but it is more frequent after the second year than in young babies. It is generally met with as a primary disease and is almost always accompanied by a certain amount of pleurisy.

Symptoms.—In many cases the first symptom observed is vomiting, and this is sometimes accompanied by diarrhœa. Occasionally there are convulsions. From the beginning the child is usually in a state of prostration. The cough is often not a prominent symptom at all, and it is apt to be suppressed as much as possible because of the pain it causes. This pain is often referred to the belly and not to the site of the pneumonia.

The respirations may not be increased in rapidity when the temperature first rises; but by the time that the physical signs develop they are generally 50-60 or more in the minute, even if only a small portion of the lung is affected. There is often a marked expiratory rhythm with noisy "grunting" expiration. The temperature curve is generally

much as in adults, but in young infants it sometimes shows marked remissions, especially towards the end of the fever. The crisis generally occurs between the fifth and ninth days, but it may set in even as early as the second or third. It is not infrequently deferred considerably beyond the usual date, owing to the disease spreading and fresh areas of lung-tissue being affected. If the temperature keeps up or rises again after the crisis, empyema may be suspected.

Cerebral symptoms occur in a large proportion of cases and often render the diagnosis very difficult, especially if there be any delay in the appearance of the physical signs. Delirium is often met with. Generally it is not marked, but occasionally it is so and the child may present a typhoid appearance. It is sometimes difficult to determine whether or not the cerebral symptoms indicate the presence of meningitis. Purulent meningitis is often caused by the pneumo-coccus, and occasionally occurs along with pneu monia.

The physical signs of consolidation are generally distinct by the fourth day; but in some cases careful and repeated examination fails to discover them until the sixth or even seventh day. In such cases the acceleration of the breathing is usually also long of beginning. In children who are very feverish, with digestive disturbances and irritation about the gums—such cases as are apt to be wrongly attributed to teething—one should always suspect the presence of pneumonia and examine frequently for it. The prognosis in croupous pneumonia is very favourable considering how ill the child generally seems to be. Unless he is very feeble, or the disease complicated, or a large area of the lung or lungs affected, the case is almost certain to end in recovery.



Treatment.—The treatment should in most cases be merely expectant. Careful nursing, the administration of a regulated amount of fluid nourishment and an occasional dose of antipyrin or phenacetin to soothe restlessness is usually all that is necessary. Complications must always, however, be carefully looked for, and if the heart's action is feeble or much of the lung affected, alcohol, digitalis or strophanthus, and strychnine are of great value.

PLEURISY.

Dry pleurisy and serous pleurisy are very rare in early infancy, and, when they do occur, are usually secondary to disease of the lung. In older children serous pleurisy is less common than in adults, but its symptoms and treatment do not differ in any important respect.

EMPYEMA.

Empyema is much commoner in children than in adults, and it is often more insidious in its onset and more obscure in its symptoms than in later life. In children also it is much less frequently tubercular in origin, and it is more often met with in a loculated form.

Causes.—The general condition of the child's nutrition is of great importance in determining the occurrence of empyema. It occurs frequently among the ill-nourished children of city slums under circumstances in which it is rare among the upper classes or in country children. It is often the sequel of scarlet fever, measles or some other infectious disease, and it also occurs not infrequently after acute pneumonia.

The exciting cause is most frequently the pneumo-coccus. It may, however, be due to pyogenic organisms, especially the staphylococcus; less frequently to the tubercle bacillus.

Symptoms.—The symptoms vary in different cases. When the case occurs after pneumonia or one of the infectious diseases, there is generally a history of interrupted convalescence with return of the fever, usually some cough, malaise, loss of appetite, and so on. Often, however, it is difficult to get any account of a sudden commencement. In such cases the child is observed to fail in strength and appetite gradually, sometimes to vomit, sometimes to sweat much at night. Then he may have developed a cough which is sometimes described as occurring in fits like whooping-cough. Sometimes there is a history of the child's being languid and hot at night, but often there is no fever.

On examining the chest, if the collection of pus is small and localised, there may be found only a patch of dulness, diminished breathing, and defective resonance. This patch is oftenest found near the angle of the scapula, but it may be situated in any region of the chest, and occasionally occurs over the apex with resonant lung below it. If the pus is present in large amount, and is free in the pleural cavity, as is usually the case where the illness is of recent origin and has come on acutely, there is generally some bulging of the affected side with diminished movement. The heart may have been displaced by the pressure of the gathering fluid. In very chronic cases the affected side is sometimes shrunk, owing to the pulmonary collapse which is present, and the heart is drawn towards the affected side. On palpation, auscultation and percussion, we get the usual



signs of fluid. The temperature may be raised, but it is frequently quite normal.

The only certain way of making a diagnosis, however, is to use an exploring syringe, and this should always be done if in doubt. If one puncture fails to discover pus where there is reason to expect its presence, the process should be repeated (frequently if necessary) either at once or at intervals of a day or two. If reasonable precautions are taken to make the syringe and needle aseptic, no harm results from the puncture. The only accident (and it rarely happens) is a little cutaneous emphysema beginning round the site of the puncture. This occurs when the needle passes through air-containing lung-tissue which is adherent to the chest wall, and it merely occasions a slight rise of temperature for a few days. Exploring for pus requires a larger syringe than that which is used for subcutaneous injections, and also a considerably larger needle than the ordinary hypodermic one. The power of the syringe and the size of the needle should be such that oil can be drawn up by it (Cheadle). If the pus is thick, as it often is in chronic cases, an ordinary hypodermic syringe may entirely fail to reveal its presence.

Treatment.—The treatment of empyema consists of course in the speedy removal of the pus. It is generally well to begin by aspirating it. A single aspiration brings about recovery in a certain proportion of cases. If the collection is a small one, and it only slowly re-accumulates, a second aspiration may be tried. Generally, however, if one aspiration fails, the pleura should be incised. If the ribs are fairly wide apart, a simple incision and subsequent draining with an indiarubber tube, will probably be the

best treatment; but, if the ribs are close together, as they very often are, so that there is little room between them for a small tube to lie in uncompressed, it will be well to consider the advisability of resecting a portion of a rib. This has the disadvantage of necessitating the use of chloroform (which is more dangerous in these cases than in almost any others in childhood), but it has great compensating advantages. It allows the masses of semi-solid purulent lymph which are often found to be more completely evacuated; it ensures at once free and perfect drainage; and, last, but not least, it makes the dressing a comparatively painless process, instead of a very painful one, as it is sure to be if the tube fits tightly between the ribs.

ASTHMA.

Bronchial spasm is met with even in young infants, and is generally in them associated with a considerable degree of catarrh. In older children more typical asthmatic attacks sometimes occur. The asthma is sometimes connected with the presence of adenoid growths, and often with dyspepsia. The prognosis is generally better than when the disease begins in later life. Great improvement usually follows the use of lobelia, iodide of potash, arsenic and cod liver oil, along with careful attention to the digestion and precautions against taking cold.

PULMONARY PHTHISIS.

Tuberculosis of the lungs, which is not merely a part of a general tuberculosis, is comparatively rare in children under five years. A serious prognosis in cases of con-



solidation of the apex in young children should not therefore be given, unless there are other indications of tubercle. Many cases which give what would, if they occurred in adults, be regarded as tolerably certain physical signs of early phthisis clear up altogether in a few weeks, under treatment with warmth, nourishment and tonics.

ENLARGEMENT OF THE BRONCHIAL GLANDS.

The bronchial glands are frequently enlarged in childhood. Generally, however, it is only at the autopsy that this condition is discovered, as they often cause no symptom during life.

Occasionally, however, they give rise to certain symptoms owing to the pressure which they exert on neighbouring structures. Thus, pressure on the superior vena cava or the innominate vein may give rise to dilatation of the superficial veins of the face, neck, and front of the chest, or even to some degree of œdema; while implication of the nerves may cause asthmatic attacks, hoarseness of the voice, or a paroxysmal cough resembling whooping-cough. Rarely pressure may be exerted on a bronchus in such a way as to cause defective respiratory sounds over the lung-area connected with it.

When the enlargement is considerable, we may find dulness over the upper part of the sternum extending to either side of it. I have seen several cases in which enlarged bronchial glands led to a mistaken diagnosis of consolidation of the right apex. In such cases there is intense bronchial breathing over the dull area owing to conduction from a large bronchus.

In some cases a loud venous hum is heard over the manubrium sterni if the child is made to throw his head back and look up to the ceiling. This symptom, however, is sometimes found in cases where the bronchial glands are not enlarged, and is sometimes absent when they are, so that it cannot be regarded as very reliable.



CHAPTER IX.

ON THE NERVOUS SYSTEM.

EXAMINATION OF NERVOUS CASES.

When a child has to be examined as to the presence of disease of the nervous system, the necessary enquiries may be divided into three groups—

1. Investigation should be made as to the occurrence of *cerebral or nervous symptoms.* Thus we may ask about any change noticed in the child's disposition and temper; whether he complains of pain in the head or elsewhere, or has photophobia (p. 14) or giddiness, whether at times he utters sudden screams, is often heard to sigh (p. 110) or grind his teeth (p. 36), whether he vomits (p. 264) and is constipated (p. 267), or whether he has had any convulsions.

2. The patient has to be examined for *physical signs.* We have already discussed the significance of the characteristic change in the physiognomy (p. 49), of distended cranial veins and a bulging fontanelle (p. 62), and of irregularity of the pulse (p. 95).

The state of the pupils is also to be noted and the presence of any nystagmus or squint, and the ophthalmoscope is to be used (p. 14). If the tâche cérébrale is present to any marked degree it is worthy of notice, as is also any degree of cervical rigidity or opisthotonos.

The limbs are to be examined as to their sensibility, and as to the presence of paralysis, rigidity, tremor or other

involuntary movements. The state of the knee jerks should be ascertained and the electrical reactions tested. The mental state is also to be noticed, especially where there is delirium or abnormal drowsiness.

3. Previous occurrence of *illnesses which are known to be followed by nervous or mental disease* should be investigated. Thus, the former presence of otorrhœa has a certain importance in suspected purulent meningitis (p. 47), and, if tubercular meningitis is possibly present, the fact of the symptoms setting in some months after whooping-cough or measles is in favour of this diagnosis.

Some of the more important symptoms and signs of nervous disease may now be considered more fully.

PAIN.

Neuralgia is extremely rare in childhood. When *persistent local pain* is complained of, it almost invariably signifies the presence of organic disease; and, if the cause is not obvious, the child must be kept under observation. Pain of this kind must never be regarded as a trivial matter.

Pain due to disease in one or other *pleura* is generally referred by the child to the middle line in front, often to the epigastrium. *Abdominal pain* is often, of course, due to digestive disturbance, but it is also frequently caused by spinal caries. Pain in the *thigh* or on the *inner side of the knee* is an early symptom of hip joint disease, but in this situation or lower down (even in the foot) it may be due to spinal caries, and it sometimes occurs at a stage when no local abnormality of the spine can be discovered.



The shock which severe pain inflicts on the nervous system of a child is such that it should never be allowed to continue long without means being taken to allay it: prolonged and painful surgical dressings should usually be done under chloroform.

HEADACHE.

In children, as in adults, pain in the head is due to many causes.

In infants, it may be the result of coryza or pyrexia, or of some gastric or hepatic disorder. If severe or persistent —especially if accompanied by vomiting—it is often a sign of meningitis or intra-cranial tumour.

In school children headaches are often complained of, and where they are recurrent they leave distinct traces on the *physiognomy*. Dr Francis Warner says, "It is not uncommon to observe that a child looks as if he had a headache. Analysing such faces you may soon observe a look of depression, heaviness, and fulness about the eyes, especially about the under eyelids; this sign is usually bilateral, and is due to a relaxed condition of the muscle (orbicularis) which surrounds the eyelids. If the patient can be made to laugh, the muscle becomes energised, and the expression of headache is lost for the moment. This sign is often best seen in the profile view."[1]

One of the commonest causes of these headaches is the presence of *refractive anomalies*, especially slight degrees of hypermetropia and astigmatism, and when this is the case the use of suitable spectacles will generally prevent their recurrence.

[1] *The Children. How to Study Them*, London, 1885, p. 51.

Dyspepsia is also a common source of headaches; and some, especially those which are confined to one temple, are due to *dental caries*. In many cases, whether there is a discoverable local cause or not, the patients are delicate children who are obviously being overworked at school and having too little fresh air and exercise.

Migraine, when it begins in young children (between two and five years), is often, according to Gowers, accompanied by rise of temperature, so that the symptoms are like those of commencing fever. As the child grows older, however, the attacks assume the ordinary afebrile character seen in adults.

Recurrent headaches in children are sometimes greatly benefited by a combination of liquid extract of ergot (m. x-xx), and solution of strychnine (m. ii.-iii) (E. Smith).

GIDDINESS.

Vertigo is sometimes found in young children. When in bed or sitting on his mother's knee, the child cries out that he is falling, or that the roof or furniture is moving. This sensation of giddiness may be a symptom of *tubercular meningitis*, or some other intracranial lesion. Not infrequently, however, it occurs quite apart from brain disease. I have known it occur, off and on, for months, in a most marked form in young children with obstinate constipation from *disordered digestion*, and nothing worse. When vertigo is present, the condition of the *ears* must of course always be investigated.

SCREAMING.

A shrill piercing scream—the "hydrocephalic cry" is one of the classic symptoms of *tubercular meningitis*. It



is by no means, however, a constant phenomenon in this disease, and a cry of this sort, without other cerebral symptoms, is of little diagnostic importance. Similar screaming is characteristic of *acute middle ear disease.* Severe and repeated screaming is also met with in cases of chronic hydrocephalus when the fluid is increasing in amount.

GRINDING OF THE TEETH.

The most extreme cases of this phenomenon are met with in cerebral disease. It is not, however, to be regarded as an important early sign of it, as it is also a common accompaniment of minor functional disturbance (p. 36).

CONVULSIONS.

Convulsions are a common and most important symptom of disease in infancy. The incidents of an infantile convulsion resemble closely those of an ordinary epileptic fit, although generally less severe. They need not therefore be described, but it should be noted that in children there is often a bilateral convulsion as a result of a unilateral brain lesion, and that it is not uncommon to find convulsions mainly or altogether unilateral in distribution, although no difference can be found at the post-mortem examination in the condition of the two hemispheres.

Causes.—The commonest exciting causes of convulsions are as follows:—

1. *Local disease or injury of the brain* or its membranes (*e.g.* concussion, hæmorrhage, abscesses, meningitis, microcephalus, or any of the other developmental or inflammatory lesions which produce idiocy) or interference with the

cerebral circulation (either venous engorgement as in whooping-cough and congenital heart disease, or anæmia as in the exhaustion of diarrhœa or in general hæmorrhage).

2. The poison of *uræmia*, of auto-intoxication and of various metallic poisons.

3. A sudden *rise of temperature* will in many children cause a convulsion, as in others and in adults it causes a rigor. Fits are not uncommon at the onset of pneumonia or of those of the infectious diseases in which there is a rapid rise of temperature. Real rigors may, however, occur even in children of two years old.

4. *Peripheral irritation of nerves* certainly causes convulsions in some children. This may be due to round worms or indigestible articles of diet in the stomach or bowel, to the irritation of scybala, difficult dentition or otitis.

In addition to these well defined exciting causes of convulsions, there are two exceedingly important and common predisposing causes, without the presence of which some of the exciting causes would not act as they do.

1. *An inherited nervous constitution* is an important element in the etiology. We find that a degree of fever, or an amount of peripheral irritation which causes fits in some families and some individual children, has no such effect in others. The occurrence of repeated convulsions in infancy, without any organic cause, certainly indicates, as Coutts has shown, a neurotic tendency likely to give trouble in later life.

2. *Rickets* constitutes an extremely important predisposing cause, probably the most important in the majority of cases. While a child suffers from active rickets, he often



has a great tendency to convulsions from slight causes or even without apparent reason. If the rickets is successfully treated, however, this tendency generally rapidly and entirely disappears.

Diagnosis of Cause.—Convulsions, therefore, occur under a great variety of conditions, and in dealing with a case the first thing to be done after treating urgent symptoms is to ascertain the cause. To do this, not only has the child to be thoroughly examined, but his age, his general condition, his past health, and recent treatment, and his other symptoms have to be taken into account.

If the patient is a new born child, born after a difficult labour, the convulsions are probably caused by a mechanical injury to the brain—very likely by meningeal hæmorrhage. If he is between six months and two years, has no signs of brain disease or fever and is rickety, the latter condition is probably the chief cause. In infants on the bottle, indigestible or unsuitable food is a common cause of convulsions. In children over two years with a high temperature, a convulsion may probably indicate the onset of an acute illness. When an older child in good health has a convulsion without obvious cause it may be difficult or impossible to determine its etiology and whether it is or is not due to epilepsy.

Prognosis.—The ultimate prognosis in a case of convulsions depends of course on the cause and on the possibility of its being removed. The immediate prognosis is almost always good. Children very seldom die in a fit, except in those fits which come on in exhausting diseases towards the end, and occasionally when the fits are associated with laryngeal spasm.

Treatment.—The treatment of a case of convulsions consists partly in attention to the patient during the attacks, and partly in the use of measures to prevent their recurrence.

When a child takes a fit it is customary to put him in a warm bath or a mustard bath, and for this a mustard pack may be substituted so as to disturb him less, but if the child is in an exhausted weakly state, baths should not be given. If the convulsion passes off rapidly, no further treatment may be necessary.

If, however, it lasts more than five minutes or frequently recurs, active treatment is called for. The first thing to be tried is an inhalation of chloroform. This is quite safe and is almost always successful in quieting the child's movements. The inhalation of nitrite of amyl is also sometimes useful. At the same time chloral may be administered by the rectum—5 grs. for a child of six months, 10 grs. for one of a year old; this should be dissolved in two ounces of water and injected as far as possible into the bowel through a catheter. It should be given in three or four portions at short intervals. Another useful remedy is morphine, which should be injected hypodermically in doses of one-twenty-fourth grain for an infant of a year old, and may be repeated in twenty minutes if not effectual (E. Smith). If uræmia is present the child should be wet cupped over the loins or leeches should be applied.

When the convulsion is over, the measures to be taken depend largely on its cause and whether it is likely to recur. Should no obvious cause be apparent, it is generally advisable to administer a purgative and sometimes also an emetic, as in a large proportion of the cases the exciting cause is connected with irritation of the alimentary tract.



If there is a painful tooth or suppurating ear, these conditions should be attended to. If there is reason to think that the peripheral irritation which existed has been removed no further treatment may be necessary, but it is usually well to administer small doses of bromide, chloral, or antipyrin, for some days.

If indigestion is the evident cause, the greatest care must be given to the diet, and if nothing else succeeds a wet nurse may have to be obtained. Where the fits are due to rickets vigorous anti-rachitic treatment generally soon stops them (p. 308).

In older children with recurring fits, it is often a difficult question to decide to what extent the habitual administration of bromides and other sedatives is advisable. Unless the fits occur frequently—more than once a week—the constant giving of bromide is inadvisable and usually does more harm than good. In such cases the administration of tonics, such as iron and digitalis, along with a largely vegetable diet, careful avoidance of emotional excitement, and occasional change of air, are much more beneficial than a course of sedatives. This is equally true whether the convulsions are of the ordinary epileptic type or are the result of a disease or arrest of development of the brain.

STATE OF THE PUPILS.

Contracted pupils are seen normally in sleep, and they are met with during waking in the early stage of meningitis and in opium narcosis.

Widely dilated pupils, responding little or not at all to the action of light, are seen in the later stages of most serious cerebral diseases and also in "hydrocephaloid."

Marked inequality of the pupils is seen in very serious cerebral disease.

STRABISMUS.

Squinting very commonly occurs in children as a result of a refractive anomaly—especially hypermetropia. It is also a characteristic symptom of tubercular meningitis and other cerebral diseases. A permanent squint may, however, develop during an illness in which there is no organic brain lesion, and a temporary squint often occurs in a marked degree, without having any serious significance, in infants of a few months old who are feverish.

NYSTAGMUS.

In many of the cases in which nystagmus is met with, in children under three years, there is also head jerking, and the condition is a trivial and temporary neurosis, probably having some connection with rickets (p. 307). This form of nystagmus differs from other common forms in the fact that the movements are sometimes of a different nature in the two eyes (*i.e.* rotatory in one and horizontal or vertical in the other) and are often confined to one eye.

Nystagmus is sometimes a symptom of serious acute or chronic brain disease. It is met with in the later stages of tubercular meningitis, in some cases of tumour of the brain, in chronic hydrocephalus, and in some forms of idiocy. It is also a symptom of local eye disease.

TÂCHE CÉRÉBRALE.

The tâche cérébrale is commonly met with in the later stages of severe cerebral cases. It is not, however, a

symptom of much value from a diagnostic point of view in the earlier stages, as it may occur in enteric or other fevers without any brain lesion being present.

CERVICAL OPISTHOTONOS.

Head retraction with rigidity of the neck, or cervical opisthotonos, generally indicates the presence of meningitis. It is sometimes seen in tubercular meningitis, but is much more characteristic of the purulent form of the disease and especially of the subacute non-tubercular meningitis of young infants. It is also met with in chronic hydrocephalus (Fig. 27), and in cases of cerebellar tumour.



FIG. 27. — Chronic Hydrocephalus following Meningitis, showing Head Retraction, in a Girl, aged 1 Year.

Although usually, when well marked, a symptom of intracranial disease, head retraction is sometimes met with apart from any cerebral or meningeal lesion. It has been seen in enteric fever, diphtheria and pneumonia, in cases where the brain was found to be normal; and it is also met with

sometimes in wasted babies with dyspeptic disturbances. A minor degree of head retraction occurs rarely in tetany. Various surgical affections, such as retropharyngeal abscess and cervical caries, cause a stiffness of the neck and drawing back of the head which may be mistaken for cervical opisthotonos of intracranial origin.

SENSORY DEFECTS.

Defects of ordinary sensibility are less frequently met with in children than in adults and unless marked in degree are difficult to estimate. General tenderness to touch and movement usually arises from the presence of some such constitutional disease as rickets or scurvy rather than from lesions of the nervous system. Pain on movement is also a very important fact, and great care must be taken to ascertain the exact nature of the movements which cause pain.

PARALYSIS.

In investigating any apparent loss of muscular power in a child, we have, *firstly*, to decide whether it is a true paralysis, or merely a pseudo-paralysis resulting from the pain which movement causes, from extreme flabbiness of the muscular tissue or from some malformation; and, *secondly*, if a true paralysis, whether it is due to a lesion of the brain, cord, or peripheral structures, or is a so-called functional palsy such as may be met with in hysteria or as the result of peripheral irritation.

PSEUDO-PARALYSIS.

Disinclination to move the limbs, owing to the pain which movement causes, is seen after *injuries* to the muscles, liga-



ments and bones. If present in the upper arm soon after birth, it may be due to injury of the upper epiphysis of the humerus during delivery. In syphilitic infants between five and twelve weeks old it is generally caused by *specific epiphysitis* and most frequently affects the upper limbs (p. 54). A somewhat similar pseudo-paralysis occurs in cases of *infantile scurvy*. This, however, is most frequently met with in children between eight and fourteen months old, and affects the lower more often than the upper extremities. It must be remembered that true paralysis (*e.g.* from anterior poliomyelitis or peripheral neuritis) is occasionally accompanied at first by severe pain on movement.

The pseudo-paralysis seen in *rickets* seems to be due more to muscular debility and laxity of the ligaments than to tenderness of the structures, although that may have some share in producing it. While it may be noticed during any stage of rickets, it rarely causes any difficulty of diagnosis except somewhat late in the course of the disease, when the characteristically rickety symptoms have more or less subsided. It is always symmetrical, and is generally noticed in the lower limbs, although the upper limbs if examined will be found similarly affected.

The weakness caused by *congenital dislocation of the hip joint*, and by various other congenital malformations of the limbs, is apt to be attributed to infantile paralysis.

Diagnosis of Paralysis.—In endeavouring to ascertain the cause of a local or general paralysis in a child, we have to enquire as to the nature of its onset and the symptoms which preceded and accompanied it, and to examine the parts affected as to tenderness to touch and on movement,

sensibility of various kinds, active and passive mobility, the state of the reflexes and the electrical reactions. We have also to remember which diseases are likely to occur at the age of the patient.

Paralysis which is present at birth may be the result of intra-uterine disease or arrest of development. Generally, however, it is caused by some injury sustained during the progress of the labour. Cases arising in this way have sometimes been spoken of as "obstetrical paralyses," but it is better to call them "*birth palsies*" (Gowers[1]).

PARALYSIS DATING FROM BIRTH.

The injury at birth may affect the nerves or the brain; the spinal cord is scarcely ever injured.

PERIPHERAL BIRTH PALSIES.

The peripheral lesion affects either the face or the arm; the lower limbs are very rarely implicated, because their nerves lie more deeply, and are therefore better protected from external injury.

Facial paralysis occurs at birth from pressure on the facial nerve by the blades of the forceps. It is generally rapidly recovered from, but in rare cases it may lead to permanent deformity.

The **paralysis of the arm** due to injury during delivery is sometimes associated with fracture of the clavicle, and not infrequently with separation of the upper epiphysis of the humerus. In these cases it is difficult to decide how much of the weakness is due to true paralysis and how much to

[1] "On Birth Palsies," *Lancet*, Vol i., 1888, p. 709.



the other injury. In many cases, however, the paralysis has a characteristic distribution which helps us to recognise the cause. The muscles affected are the deltoid, biceps, supinator longus, infraspinatus and supraspinatus. While therefore the shoulder and elbow movements are greatly interfered with, those of the hand and fingers are unaffected. This form of paralysis is due apparently to damage of the branch which passes from the sixth cervical nerve to the brachial plexus. It may be produced by the pressure of the blade of the forceps or of a hook or finger used for bringing down the shoulders. It is also said that simple traction on the arm may cause it. It often recovers in a few weeks, but, if the injury is severe, its result may be permanent.

The *diagnosis* of these cases from infantile spinal paralysis is easy, when we take into consideration the distribution of the paralysis and the very early date at which it is observed, for poliomyelitis rarely occurs during the first six months. When the paralysis persists, it is sometimes mistaken for that due to cerebral injury at birth. The main points to be considered in the diagnosis are tabulated as follows by Sachs [1]:—

PERIPHERAL PALSIES.	CEREBRAL BIRTH PALSIES.
1. One arm only affected.	1. Hemiplegia or diplegia common; brachial monoplegia rare.
2. Flaccid paralysis with atrophy.	2. Spastic paralysis with or without atrophy, with tendency to rigidity.
3. Deep reflexes absent, surely not exaggerated.	3. Deep reflexes increased.

[1] *The Nervous Diseases of Children*, 1895, p. 225.

4. Changes in electrical reaction from simple loss of faradic response to complete reaction of degeneration.	4. No changes in electrical reaction.
5. No convulsions.	5. Convulsions apt to occur and to be repeated.
6. Deformity and arrested growth of entire extremity.	6. Flexion contraction of fingers, wrist and elbow.
7. Sensation may be impaired.	7. Sensation not affected.

The treatment of this form of paralysis should not begin until two or three weeks after birth, when gentle massage may be commenced. Later, electricity may be applied. As the child gets older, regular massage and gymnastics are to be insisted on.

CEREBRAL BIRTH PALSIES.

Injuries to the brain during labour are more common than lesions of the nerves. In the great majority of cases, the cerebral injury is secondary to a **meningeal hæmorrhage**, which causes pressure and sometimes laceration of the underlying cortex.

The lesion may be due to pressure by the maternal parts on the head, or to that of the forceps and other artificial means used to expedite delivery. According to Dr Herbert Spencer[1] "Cerebral hæmorrhage is more frequently found in still-born children delivered by the forceps than in those born by the breech, and in this latter more frequently than in those born naturally by the head." It is much more frequent in first-born than in other children. Of 26 cases investigated by Gowers, 16 occurred in first-born children.

[1] "On Visceral Hæmorrhages in Still-born Children," *Trans. Obstet. Soc. London*, Vol. xxxiii., 1891.



Children who are the subjects of this lesion are often apparently still-born, and only come round after prolonged artificial respiration. Frequently they have convulsions. As they get older, it is found that they are paralysed. In the great majority of cases, the paralysis affects both sides and both upper and lower limbs, although usually one side is more severely affected than the other, or the legs more markedly than the arms. Occasionally the paralysis seems quite unilateral, and sometimes also there is no ascertainable affection of the arms.

In well marked cases a distinct rigidity of the lower limbs with greatly increased knee-jerks, may be discovered within the first few weeks, but often the parents notice nothing wrong until attempts at standing and walking are made. The arms are stiff also about the shoulders. Incoordination and sometimes athetotic movements of the hands can be early noticed. The child has unnatural difficulty in grasping objects, and, when they are grasped, in letting them go. Squinting is common, and mental defect is present in a greater or less degree, in a considerable majority of the cases (Fig. 30, p. 163).

Cases of paralysis due to intra-cranial hæmorrhage at birth, show little change during the early years of life. It is only when the child is old enough to exert his will in moving the other limbs, that improvement may be looked for.

When convulsions occur from time to time, sedatives and tonics may prove useful. For the paralysis, however, neither medicine nor electrical treatment is really of any use. Slight improvement follows persevering massage with passive movements and regular exercises.

PARALYSIS SETTING IN DURING INFANCY AND CHILDHOOD.

Paralysis arising in childhood may be due to lesions of the nerves, of the spinal cord, or of the brain.

PERIPHERAL PARALYSES.

Facial Paralysis.—When facial paralysis sets in apart from an injury it is due to ear disease in the great majority of cases. Occasionally it is caused by a chill and sometimes it is a symptom of a cerebral tumour or basal meningitis (especially the tubercular form).

Diphtheritic Paralysis.—The form of multiple neuritis known as diphtheritic paralysis is much commoner in childhood than those due to any other causes. It differs from the other varieties in its distribution and in the order in which the parts become affected.

The *symptoms* may set in within a week of the commencement of the throat affection, but generally they do not appear until between the second and fourth week after the disappearance of the false membrane. The part earliest and most frequently affected is the soft palate; and its implication leads to nasal speech and to the return of fluids through the nose during drinking. Later, the pharynx and œsophagus may also be paralysed, and the child is then unable to swallow. Paralysis of accommodation is often added, so that the patient is unable to read small print or to thread a needle. Frequently there is more or less paresis of the lower limbs, less commonly of the upper, and of the muscles of the back and neck. The knee-jerks are early lost, and may not be regained for several months.



Paralysis of the heart and of the respiratory muscles is sometimes met with. That of the heart is often unaccompanied by other paralysis, while that of the muscles of respiration is generally preceded by paralysis of the palate and often accompanied by pharyngeal paralysis. Paralysis of the diaphragm and other respiratory muscles is almost invariably due to diphtheria. In rare cases, however, it is met with without there having been any previous symptom of that disease, and in some at least of these it has followed influenza.

Diphtheritic paralysis may last from six to eight weeks, but always tends to recover; and, when it affects the limbs, never leaves permanent contractures like the neuritis which sometimes follows other infectious diseases. Those cases, however, in which the heart, respiratory muscles and pharynx are affected are often fatal.

The *treatment* of diphtheritic paralysis consists in the administration of tonics such as iron and digitalis, and especially in the maintenance of the general strength by careful attention to the diet. If the power of swallowing begins to be interfered with, recourse must be had at once to forced feeding (p. 246). Many children recover after nasal feeding for weeks who, without it, would have died in a few days. If the muscles of respiration are affected, strychnine and belladonna are indicated, and special care must be taken to avoid cold, as any affection of the respiratory passages is apt to prove rapidly fatal.

Other Forms of Peripheral Neuritis.—Severe multiple neuritis of the extremities occasionally occurs as a sequel to other infectious diseases, such as influenza, measles, whooping-cough and enteric fever. It is usually sym-

metrical in its distribution, affecting both arms, both legs, or all four extremities. It is generally characterised by sensory as well as motor paralysis, and there may be tenderness along the course of the affected nerves. There is more or less marked reaction of degeneration and usually loss of the deep reflexes.

The distal portions of the extremities are generally first and most severely affected. The muscles most markedly



FIG. 28.—Deformity resulting from Peripheral Neuritis, which followed an attack of Measles in a Boy, aged 6 Years.

paralysed are usually the extensors of the foot and hand, the peroneal and musculo-spiral being the nerves most liable to be affected.

The treatment consists mainly in keeping the parts warm and improving the general strength by careful feeding, tonics, and especially cod liver oil ; and later in massage and exercises. If pain is severe in the early stage local heat may be applied and sedatives given.

In many cases, complete recovery takes place, but in



some the limb is crippled by permanent contractures (Fig. 28).

Peripheral neuritis is also met with as a symptom of poisoning by arsenic and lead.

SPINAL PARALYSIS.

Paralysis of spinal origin may occur in children rarely as the result of tumour, hæmorrhage, transverse or disseminated myelitis, and in cases of Pott's disease it is often due to compression myelitis. Various forms of progressive muscular atrophy, Friedreich's ataxia, and other rare types of paralysis also develop in childhood. Far the most important disease of the spinal cord, however, that is met with in childhood is poliomyelitis or infantile spinal paralysis as it is usually called.

Infantile Spinal Paralysis.—The *causation* of the acute poliomyelitis, which gives rise to infantile spinal paralysis and results in destruction of the large ganglion cells of the portion of the anterior horn affected, is still a matter of dispute, but recent authorities seem generally inclined to believe that it is due to the action of micro-organisms. It occurs most commonly during the second year, but is also frequently met with during the latter half of the first and during the third years; it is rare after five. It most frequently occurs during the warm months of the year.

The *onset* of the illness generally resembles that of an infectious ailment. In the midst of perfect health the child becomes feverish and drowsy, vomits, and complains of pain and tenderness. The temperature goes up to 101° to 103°, and sometimes there are convulsions. After a day or two, it is found that one or more of the limbs cannot be moved.

In other cases the fever is absent or it is so slight as not to be noticed, and the child, after a somewhat restless night, awakes paralysed in the morning. The paralysis of the parts affected is generally complete from the first, or at least within the first twenty-four to forty-eight hours. After remaining about the same for a few weeks, there is generally more or less return of power in some of the muscles, but such spontaneous improvement is said to be limited to the first three months after the onset. Within two months of the beginning of the illness, very marked wasting of the affected limb is seen, associated with lowering of its temperature; and, on electrical examination, reaction of degeneration is discovered. In severe cases, the whole of the affected limb, including the bones, ceases to grow at the same rate as the other one.

The *distribution* of the paralysis varies considerably in different cases. Most frequently the disease affects one lower limb only; often both of the lower extremities. Sometimes all the limbs are affected, sometimes one arm and one leg, and sometimes one arm only. It is rare for the arm and leg of the same side to be affected. Sometimes there is marked implication of the muscles of the back or abdomen. Very rarely some of the facial muscles may be affected. When a number of parts are affected at first, there is generally a rapid improvement or recovery of some of them, but when a single limb is affected it is exceedingly rare for it to recover entirely.

The *diagnosis* cannot be made before the paralysis develops but, after that, it is generally easy. Sometimes, however, cases of rachitic or scorbutic pseudo-paralysis or of infective epiphysitis are mistaken for infantile paralysis, and in older



children infantile spinal paralysis of some of the muscles of the lower limbs causes defective movements which are apt to be attributed to congenital malformations or to hip joint disease. The diagnosis between spinal and cerebral paralysis in childhood will be referred to later.

The most effectual means at our disposal for improving the condition of muscles affected by spinal infantile paralysis is persevering massage combined with hot and cold salt douching, and, when the child is older, with active exercises. Electricity is also of some use if it can be properly applied for a prolonged period. The directions to mothers, respecting children with paralysed limbs, which are in use at the Royal Hospital for Sick Children will be found in Appendix B.

CEREBRAL PARALYSIS.

Paralysis from brain lesion is commoner in childhood than that from disease of the spinal cord. It is met with frequently as one of the symptoms of tubercular meningitis or of tumour or other disease of the brain.

Infantile Cerebral Paralysis.—There is a class of cases of permanent paralysis which, although due to a variety of cerebral lesions, resemble each other closely in their symptoms. As their cause cannot usually be determined during life, these cases are best referred to as infantile cerebral paralysis or as infantile hemiplegia—the paralysis being nearly aways unilateral.

According to Osler[1] "infantile hemiplegia is commonly the result of a variety of different processes, of which the most important are:—

[1] *The Cerebral Palsies of Children*, 1889, p. 96.

"1. Hæmorrhage occurring during violent convulsions or during a paroxysm of whooping-cough.

"2. Post-febrile processes: (a) embolic: (b) endo- and peri-arterial changes: and (c) encephalitis.

"3. Thrombosis of the cerebral veins."

The *onset* of the *symptoms* in these cases is generally sudden and is usually, although not always, accompanied by convulsions or coma. Often there is considerable rise of temperature, and occasionally vomiting. Rarely the paralysis is slight at first, and after repeated convulsive attacks becomes more complete; generally, however, it is complete from the beginning. The face is often, but not always, affected.

The arm is generally more completely paralysed than the leg. The muscles are not usually much atrophied, but they are generally in a state of more or less rigid contracture. The leg recovers to a greater extent than the arm, and occasionally no trace of the paralysis remains.

The deep reflexes are almost invariably increased. Sensation is usually quite unaffected. In a considerable proportion of cases there are choreic or athetotic movements. Aphasia is occasionally found in cases of left as well as of right hemiplegia. Mental defects are common. Epileptiform seizures often occur; they may be of the nature of petit mal, or general convulsions with unconsciousness, but most commonly they consist in unilateral spasms without loss of consciousness.

The *diagnosis* of the lesion in these cases is usually exceedingly difficult at first. It is generally, however, tolerably easy to distinguish between them and cases of

infantile spinal paralysis. The main points of difference are given as follows by Sachs[1]:—

ACUTE SPINAL PARALYSIS.	ACUTE CEREBRAL PARALYSIS.
Onset sudden with fever, coma, and convulsions. Convulsions rarely repeated after first few days.	Onset sudden with fever, coma, and convulsions. Convulsions apt to be repeated.
Paralysis flaccid, associated with atrophy.	Paralysis spastic; no atrophy; associated with rigidity and contractures.
Paralysis widely distributed, possibly involving all extremities, or narrowly limited to one member, or even a single group of muscles.	Paralysis generally hemiplegic, sometimes diplegic or paraplegic, Monoplegia rare.
Electrical reactions altered (R.D.)	Electrical reactions normal.
Deep reflexes diminished or lost.	Deep reflexes exaggerated.
Intellect never permanently involved; no epilepsy.	Intellect often involved; epilepsy frequent.

The *prognosis* is almost always unfavourable. In rare cases, especially those due to hæmorrhage (such as occasionally occurs in the course of an attack of purpura), there may be a complete recovery of power. In most cases, however, very little improvement, if any, is observed. In some cases, even when convulsions have not been present at the onset, the damage to the brain predisposes to their later occurrence; and, in cases where the intellect is not seriously affected from the first, there is apt to be a tendency to mental disease in later life.

This form of paralysis, after the first few weeks, should be *treated* by massage and especially by active and passive exercises. If energetically persisted in, these certainly lead to some improvement, but they are less beneficial in cerebral than in spinal paralysis.

[1] *Loc. cit.*, p. 305.



FUNCTIONAL PARALYSIS.

The first symptom which is noticed in some cases of chorea is a gradually developed inability to use one arm. This is sometimes mistaken for commencing paralysis from organic disease, but the loss of power is never complete. In some severe cases of chorea also, the paretic element is so much more prominent than the involuntary movements or the inco-ordination that the patient is apt to be regarded as suffering from some form of paralysis. Very little care, however, will prevent this mistake.

Hysterical paralysis sometimes occurs in children, but it is certainly rare.

TREMOR.

Tremor is a very rare symptom in young children. A general tremor is sometimes met with in some cases of infectious disease such as enteric fever and influenza, and in tubercular meningitis, and it is characteristic of multiple sclerosis. Local tremor of a limb is sometimes seen in cases of cerebral tumour.

DROWSINESS.

Drowsiness is often a symptom of intra-cranial disease. In some cases of tubercular meningitis, it is a prominent feature during the early stage. After epileptiform convulsions, the patient is frequently drowsy for hours; and if a long series of fits occur at short intervals, this drowsiness may become so marked and last so long that, even in cases where the brain does not ultimately suffer, it may look as if the child were becoming an idiot (Fig. 29).

Drowsiness is not, however, always a sign of brain mischief. We meet with it also in uræmia, in some

gastric cases, and in some feverish disorders such as pneumonia. It is also of course often the result of medicine (*e.g.* bromide), and when it sets in, in the course of serious illness, it is especially important before deciding its significance to make sure that it is not merely due to excessive doses of alcohol.

STATE OF THE KNEE JERKS.

To obtain the knee jerks in a young child, while he is sitting on his mother's knee, it is best to place the palm of the left hand under his foot, and to support his leg in this way as by a stirrup: then, on tapping gently with the forefinger of the right hand, or better with a percussion hammer, the amount of movement which takes place is readily felt as well as seen. In strong healthy children the knee jerk is generally easily obtained. In those with weak and flabby muscles, it may be difficult to make sure of its presence. It is absent in diphtheritic paralysis and other forms of peripheral neuritis; in progressive muscular atrophy and



FIG. 29.—Prolonged Stupor following repeated Eclamptic attacks in a Boy, aged 6 Months.



pseudo-hypertrophic paralysis; in those cases of infantile spinal paralysis in which the extensors of the thigh are affected, and in various other conditions.

The knee jerks are increased in most cases of infantile cerebral paralysis, in myelitis and pressure on the cord above the lumbar region, and in certain other forms of organic disease of the brain and spinal cord. They are also exaggerated to a less extent in children who have suffered from a prolonged feverish illness such as enteric fever. They may be increased to a considerable degree in cases of severe and long standing hysteria.

ELECTRICAL REACTIONS.

When it is important to ascertain the electrical reactions in a young child, it is generally best to administer chloroform, as otherwise the child's struggles will make a proper examination exceedingly difficult.



CHAPTER X.

ON MENTAL DEFICIENCY.

Insanity in the ordinary sense of the term is very rare in children, and cannot be recognised in young infants. Slight *changes in the child's emotional state* and in his character are often observed during the onset of tuberculosis and in various forms of intra-cranial disease. These are of course more readily noticed by the parents than by the medical attendant, but they are sometimes of considerable diagnostic importance. When we find evidence of mental abnormality in infants and young children, it almost always indicates the presence of some degree of imbecility or idiocy.

IDIOCY AND IMBECILITY.

Idiocy is defined by Dr Ireland[1] as "Mental deficiency, or extreme stupidity, depending upon malnutrition or disease of the nervous centres, occurring either before birth or before the evolution of the mental faculties in childhood"; while the term imbecility merely signifies a lesser degree of the same condition. These two words have naturally very unpleasant associations connected with them and should never be mentioned in the hearing of the child's parents or friends. Feeble-mindedness and mental deficiency are comparatively inoffensive terms, and may be used to

[1] *The Mental Affections of Children*, Edin. 1898.



designate any degree of mental impairment from the slightest to the most severe.

Dementia differs from idiocy in that it consists in deterioration of a primarily normal intellect, while in idiocy the intellectual defect is present from the first. Progressive dementia is occasionally met with in children. It is sometimes due to the presence of so-called adolescent general paralysis. Whether it assumes this form, or takes a less typical and more irregular course, it is almost always due to congenital syphilis.

All the forms of disease which damage a child's mental powers and give rise to idiocy also lessen his power of resistance to disease and death, hence a large majority of idiots die within a few years of birth. There are therefore many more infants than older children affected in this way and many more children than adult patients.

THE DIAGNOSIS OF IDIOCY.

The symptoms by which we recognise the presence of mental defect in infants and in young children are largely bodily as well as mental. They may be divided into five groups, summarised as follows:—

1. Some children present from birth or early infancy such *an abnormality of bodily conformation* as proves them to be subjects of a disease of which mental defect is a cardinal symptom. Thus, the diagnosis that the child is a cretin or a "Mongolian," or suffers from a severe degree of microcephalus, hydrocephalus, or spastic diplegia, includes a diagnosis of imbecility. In these cases the opinion that an infant is an imbecile can therefore often be confidently formed, long before he is capable of showing mental



peculiarities, and some idea of the degree of his probable improvement may also be possible.

2. There are a series of *minor bodily malformations*[1] on which much has been written in recent years as indicating a tendency to mental defect. Such are abnormally vaulted and cleft palates, hare-lips, defects of the rim of the ear, differences in shape of the two ears, marked epicanthic folds at the inner corner of the eyes, spina bifida occulta, congenital malformations of the heart, and many others.

With reference to this class of malformations Dr Warner[2] gives what he calls the "*law of coincident development.*" This is to the effect that "when any part or parts of the body present signs of defective development, the brain is very apt to be defective likewise." All these defects may be met with in children of excellent intelligence, but they are more common in the mentally defective. The fact of their presence may sometimes constitute confirmative evidence of imbecility, but alone it can never be of much importance. Dr Langdon Down[3] thought that the presence of bodily defects in idiocy indicated that the cases possessing them were of congenital rather than of acquired origin; but, if this is a rule, it is one to which there are many exceptions.

3. The *periodic occurrence of convulsions* is often associated with the presence of mental impairment. This may be the result of the fits, if they are numerous, but frequently it is merely another manifestation of the organic brain disease or defect which is causing them. All imbeciles

[1] See *The Study of Children*, by Dr F. Warner, London, 1897.
[2] *The Children. How to Study Them*, London, 1887, p. 11.
[3] *Mental Affections of Childhood and Youth*, 1887.

(except cretins) are liable to suffer from fits. These may be of the regular epileptiform type; but often, in young infants especially, they consist, to begin with, merely in a sudden start, the head, arms and legs being momentarily jerked forwards. With these slight attacks there is a temporary loss of consciousness, and there may also be a little stertorous breathing; after them the child usually cries as if he were distressed.

4. The abnormal state of the child's intellect is often most plainly betrayed by *gestures and actions which are altogether abnormal*, showing that the mind, as Dr West puts it, is not only dwarfed but deformed. Thus, in young babies we may have abnormal fretfulness with constant causeless crying. I have known several such infants who were dosed for weeks by myself or others, and not a few who were circumcised, under the impression that they were suffering from bodily pain, before the real cause of their crying was discovered. Again, there may be constant restless rolling of the eyes, the baby never looking straight at anything as a healthy child should do. Sometimes there is unmeaning laughter with exaggerated gestures, wayward and impulsive actions, or perhaps dirty and disgusting ways of eating. Often we find utter apathy, with absence of the natural reflex muscular movements, so that, *e.g.*, the baby feels like an inanimate object in his nurse's arms when she tosses him up and down, instead of making springing movements with the limbs in his enjoyment of the motion, like a normal infant.

5. The above-mentioned grosser indications of idiocy may be absent, and the diagnosis may have to be founded on the degree of *delay in the development of the bodily and*



mental powers that is present, taken along with the surrounding circumstances. Thus, as we have already seen, we must think of mental defect as possibly present if an infant is very long of learning to hold up his head, to sit, to use his hands, to stand and to walk, and especially if he does not show the natural desire of the healthy child to exercise all his developing motor faculties. Or again, if he is backward in noticing objects, and in responding to the smile and voice of his mother or nurse, and at a later stage backward in speaking.

Backwardness in the acquisition of these natural actions and gifts may of course be due merely to temporary debility accompanying or following bodily illness, and this is often the case. If, however, the degree to which it is present is marked, and the child shows no sign of debility to account for his backwardness, we will probably be right in attributing it to mental defect.

VARIOUS TYPES OF IMBECILITY AND IDIOCY ACCOMPANIED BY GROSS BODILY DEFECTS.

The classification of the pathological conditions which give rise to imbecility and idiocy is a very difficult matter, and we shall not speak of it here. A few facts may, however, be given with regard to the diagnosis and prognosis of the commoner forms of idiocy and imbecility which are accompanied by marked bodily defects.

Microcephalus.—The first group is not a large one, namely that of microcephalic idiots. These children can be recognised in early infancy from their very small and peculiarly formed heads (Figs. 19 and 20, p. 58), and the

fact that their fontanelle closes abnormally early, usually before the fifth month. Apart from the cranium, the child's body appears normal and well grown in infancy, and the features of the face are regular and well formed. The children in early infancy are strikingly unobservant, and usually quite apathetic unless they are hungry.

The prognosis both as to life and mental progress is very bad. Microcephalic children generally die very early, and if they survive they are often subject to fits. They usually show comparatively little improvement under educational influences. It used to be supposed that it was an early closure of the fontanelle which prevented the growth of the brain in microcephalus, and some years ago the operation of craniectomy was recommended in order to give more room for its expansion. It is, however, believed now that the premature ossification of the cranium is the result of the lack of development of the brain and not its cause, and it is found in practice that the operation does not really relieve the mental condition.

Chronic Hydrocephalus.—This is not a very uncommon cause of mental defect. It may be congenital, or it may arise soon after birth. Not infrequently it follows non-tubercular meningitis. The condition is easily diagnosed by the enlargement and altered shape of the head and the downward direction of the eyeballs (Fig. 21, p. 59). The child's body is very weak and puny, and he is often subject to fits.

If the hydrocephalus is at all severe in degree, there will always be some permanent damage done to the intellectual functions. In slight cases, however, the mental powers may scarcely suffer at all, and even in severe cases the effect is

usually less than might have been expected from the appearance of the head. Hydrocephalic imbeciles are gentle and amiable in disposition, and are capable of a considerable amount of education.

Cerebral Infantile Paralysis.—In any form of paralysis from cerebral disease, there may be some degree of mental impairment. It is most likely to be severe in those cases of diplegia in which meningeal hæmorrhage at the time of birth has led to atrophic changes in a large area of cortex on both sides of the brain (Fig. 30). There may, however, be considerable mental defect in cases of even comparatively slight hemiplegia or paraplegia; and in children who are by no means idiotic or even imbecile, there is often some degree of mental instability and emotional weakness, or a tendency to epileptic fits.



FIG. 30.—Idiocy from Infantile Cerebral Paralysis. Girl, aged 14 Months.

The diagnosis of those cases of paralysis need not be discussed here. Their most striking feature is the stiffness and spastic condition of the limbs, and this is obvious even in early infancy. As the children grow older, the damaged

brain fails to enlarge and develop as it should do, and if the lesions are extensive the head remains much smaller than it should be. Consequently, these children are often spoken of as microcephalic. The form of the head is, however, different from that in real microcephalus; and there is no tendency to premature closure of the fontanelle. If the cerebral lesion is severe, the growth of the whole body will also be interfered with so that the child may look a good deal younger than he is.

These children, like other imbeciles, often die early. If they survive, their intellect suffers in proportion to the extent and position of the cerebral lesion. While in the worst cases the child remains a hopeless idiot, in many of the slighter cases there is considerable mental capacity—a good deal more than the stiffened limbs and the defective speech would lead one to expect.

Mongolian or Kalmuc Imbecility.— An interesting and quite distinct class is formed by those children who are now universally known by the somewhat unfortunate name of Mongolian or Kalmuc imbeciles, owing to the curious resemblance pointed out by the late Dr Langdon Down between their physiognomy and that of members of these races. They are comparatively common, forming, according to Dr Shuttleworth,[1] nearly 5 per cent. of all imbeciles. Anyone familiar with their characteristic appearance can readily diagnose them even at the time of birth, but they are often mistaken for cretins.

The anatomical peculiarities of these children are numerous and distinctive (Figs. 31-35). The features are small, short and rounded; and generally, like the rest of

[1] *Mentally-Deficient Children*, 1895, p. 28.





FIG. 31.—Boy, aged 18 Months.



FIG. 32.—Girl, aged 2 Years.



FIG. 33.—Girl, aged 3 Months.



FIG. 34.—Boy, aged 8 Months.



FIG. 35.—Girl, aged 6½ Months.

MONGOLIAN IMBECILITY.





the body, they are reddish in tint. The head also is short (brachycephalic) and rounded, and strikingly devoid of eminences.

The eyes are sometimes rather near one another, and in most cases the axes of the palpebral fissures are abnormally oblique. In a large proportion, also, there is a marked development of the so-called epicanthic fold of skin at the inner angle of the eye. The tongue often protrudes a little when the child is at rest, being apparently too large for the mouth. In older children the mucous membrane of the tongue is always fissured more or less deeply, but this condition is not seen in children under two years old. The children generally have the habit of sucking their tongues. The hair is usually scanty and dry. The skin is soft in infancy, although it is usually dry and harsh in older children.

The limbs are soft and small-boned and their joints have unusually lax ligaments so that they are easily hyper-extended. The hands are specially characteristic and differ markedly from those of cretin babies. The wrist and the metacarpal portion of the hand are small, and the latter very soft from the smallness of the bones and the yielding character of the ligaments. The fingers are usually rather thick for the size of the hand, but taper at the tip and are not so square-pointed as those of cretins. The little finger is generally dwarfed and curved towards the ring-finger.

The development of these children is slow in many ways. The dentition is generally backward. The muscular movements are slow of being acquired, so that the baby often does not hold up his head till the sixth or even the ninth month, or sit till the end of the first year, and he does not walk generally until the third year. The grasp also is



usually feeble. Speech is learned late and slowly, and it is guttural and indistinct. The disposition is often bright and lively and the child, although he is distinctly backward, may be quick at doing things which are learned by imitation.

The body-growth is almost always backward, even from birth, so that at eight months the infant looks not more than six months old, and at eighteen months about a year. The general strength also is much below the average, so that acute diseases of all kinds are very badly borne, and slight bronchitis is apt to lead to fatal atelectasis or pneumonia. Fits occasionally occur, although not so often as in most other forms of imbecility. The liability of these children to succumb to disease—especially to tuberculosis and pneumonia—is such that most of them die in infancy or in early childhood. Only a small proportion reach adolescence or adult life.

In giving a prognosis as to the child's future capabilities, it must be remembered that these children always improve considerably when time is allowed for their retarded development, and sometimes they make fairly satisfactory progress under careful training. From their earliest infancy, however, it may be foretold that although they will never be more than imbeciles of a somewhat low grade, they will almost certainly be cleanly in their habits, and amiable and affectionate in disposition.

At or about puberty they sometimes become very fat. When this occurs, the administration of thyroid substance may be of considerable use. Under other circumstances, however, so far as my experience goes, it is of no value whatever in the treatment of this disease.

Cretinism.—The characteristic appearance and symptoms



of cretinism as it is seen in adults and older children, the extremely stunted growth, large head, relatively short thick-set limbs, thick, dry, redundant skin, with supra-clavicular fatty tumours, bloated features and often protruding tongue, and the other well-known symptoms, form a clinical picture which is not easily forgotten or mistaken for anything else.

None of these marked symptoms, however (with the exception of the protruding tongue), are usually present at birth except to a slight degree, so that the condition is less easily diagnosed in young children than in older patients. Cases of greatly deformed new-born cretin babies have, indeed been described with large fatty tumours and other characteristic appearances, but these must be extremely rare in this country. As a rule, even in cases which afterwards present the severest type of the disease, the child's relatives see little amiss with him until he is several months old. All that the mother usually notices at first is that the child is too quiet and dull, that he does not cry out like other children and scarcely ever laughs. He is also always extremely constipated. The protrusion of the tongue is also often remarked on, but no other physical abnormality is observed.

This tardy development of the characteristic signs of the disease makes it especially important that we should be on the outlook to mark its earliest indications. There is good reason to believe that the ultimate degree of improvement in these children varies directly with the earliness of the age at which the treatment is begun.

Although the mother may fail to see anything wrong with the child at first, careful examination will reveal quite enough physical change to establish a diagnosis of the cause

of the dulness even in very early infancy (Figs. 36 and 37). The face will be pale usually and markedly puffy; the forehead always somewhat wrinkled when the eyes are open, the hair dry and scanty and the fontanelle widely open. There is generally also snoring at nights. There may be some fulness in the supra-clavicular region although distinct fatty tumours rarely form in infancy; and the ease with which the tracheal rings can be felt will indicate an absence or defect of the thyroid. The characteristic broad, thick short hands, with the wrinkled seemingly redundant skin, are very characteristic, and will sometimes be more helpful in the diagnosis than any other single feature. The temperature is subnormal.



FIG. 38.—Achondroplasia. Still-born infant.

The diagnosis of cretins from other types of mentally deficient children presents no serious difficulty provided the examination has been carefully made. The two classes of deformed children which are most apt to be mistaken for cretins are those who are suffering from achondroplasia — the so-called "fœtal rickets"— and the Mongolian imbeciles we have just been considering.

Typical *achondroplasic dwarfs* have at birth a very considerable resemblance to cretins (Fig. 38). Thus, they have a relatively large broad head,



FIG. 36.—Sporadic Cretinism. Boy, aged 7½ Months.



FIG. 37.—Sporadic Cretinism. Girl, aged 15 Months.



a marked pug-nose with usually a distinct depression at its root, and often some protrusion of the tongue out of the mouth; their limbs, also, including the hands and feet, are thick and extremely short. This resemblance, however, is not to cretin babies so much as to those who are old enough to have developed to the full all the characteristic cretinous deformities. The limbs of cretins, for example, are not very short as compared with their bodies in early infancy. The great disproportion arises only in the course of years.

Then we may further notice that the skin in the achondroplasic baby is soft and natural, the hair fine and plentiful, the temperature not subnormal, and the mental condition, if he survive, like that of other infants. His thyroid also may usually be felt distinctly and he does not develop fatty supraclavicular pads. His hands, although like those of cretins in being short, with crumpled, apparently redundant skin, differ distinctly in showing a distinct parting between the middle and ring fingers (Fig. 39) which curve away from one another.



FIG. 39.—Achondroplasia. Hand of Boy, aged 5 months.

Many *Mongolian imbeciles* also have a certain resemblance to cretins. This, however, is much more striking when they are older children or adolescents. In infancy they have really little in common beyond the mental backwardness, the frequently protruding tongue, the scanty dry hair and the general fact that they are rather ugly-looking babies. On the other hand the Mongolian infant differs from the

cretin in having a soft skin, slender small-boned limbs, a thin neck with an apparently normal thyroid, and the peculiarity of the hands already alluded to.

With regard to the result of thyroid treatment in cretinism it may be stated that, while its careful administration from the earliest infancy may be expected to result in complete recovery, so far as the bodily growth and deformity are concerned, the same cannot as yet be said with regard to the mental defect. It will be surely and steadily improved but, so far as I know, there has been no account published of any cretin who has *quite* reached normal intelligence.



CHAPTER XI.

ON THE EXAMINATION OF THE MOUTH AND THROAT.

THE examination of the mouth and throat may be held to include the inspection—and in some cases the palpation—of the lips, tongue, teeth, gums, palate, tonsils and fauces, pharynx, naso-pharynx and larynx.

It would be difficult to insist too strongly on the importance of a thorough examination of the mouth and throat in all cases of feverish illness in childhood, whether there are any symptoms of throat affection or not. Many cases of unexplained fever are in this way at once cleared up.

METHODS OF EXAMINATION.

If an infant is not frightened and is not teething, it is generally easy to induce him to open his mouth by gently touching his lips with the finger; and, when the mouth is open, the finger can be readily passed along the gums till it touches the pharynx and this compels the child to give a good view of the fauces.

To examine the back of the throat, in children who may be inclined to resist the proceeding, is sometimes difficult and requires a little practice. The main points to be attended to are, firstly, to have the child facing a good

light in such a way that when his mouth is opened the fauces will at once be illuminated without change of position; and, secondly, to have his arms held or secured to his side by a towel pinned round him, so that he may not be able suddenly to seize the tongue-depressor or the hand that holds it. If the examination of the throat is carried out rapidly and gently on the first occasion and no struggling allowed, it will be much easier the second time; while, if the child is allowed to struggle, it will be more difficult on each occasion. For ordinary cases the handle of a common spoon is preferable as a tongue-depressor to any special spatula. It is quite as efficient and much less likely to frighten the child.

Digital palpation of the fauces, pharynx and naso-pharynx is extremely important, especially in young infants, because of the difficulty which often exists in getting a full and satisfactory view of the parts; and with practice much information can be got from it. It is impossible to make sure of the presence or absence of a retro-pharyngeal abscess without examination with the finger, and palpation is also necessary for the examination of adenoids.

When examining the back of the pharynx with the right forefinger in older children, it is advisable to press the child's cheek between his side teeth with the fingers of the left hand so as to prevent his biting the examining finger, or to use a gag.

THE LIPS.

Pallor of the lips in children as in adults forms a trustworthy indication of anæmia; and even a slight purplish



tinge is sometimes of great importance in heart and lung cases as a sign of commencing failure of the heart.

Eczema and herpes of the lips are not uncommon in young children, and several forms of stomatitis, such as the aphthous, syphilitic and diphtheritic varieties, may also affect them severely.

THE TONGUE.

In new-born children the mucous membrane of the mouth is of a dark red colour, and at birth and for the first three or four months it is noticeably dry owing to the want of saliva. For the same reason the tongue is always more or less coated in young infants.

In older children it is not uncommon to find, on the dorsum of the tongue, red areas covered with thinned epithelium and bounded by white or greyish elevated margins which have a crescentic or irregularly rounded contour. When this condition is extensive, its irregular outlines often resemble those of a map, and hence it is often spoken of as the "*mapped*" or "*geographical*" *tongue.* In children, the condition usually gives rise to no local pain, and it does not necessarily indicate any appreciable digestive disturbance. It has no connection whatever with congenital syphilis. Tongue-tie is often complained of, but is seldom found to such an extent as to warrant operative interference. When, however, the frænum is so tight that the tip of the tongue is turned downwards when an attempt is made to protrude it, it should be divided as it may possibly interfere with sucking, and in after life, with articulation.

A small erosion or *ulcer* is occasionally found *below the*

tip of the tongue (Fig. 40) and often on the margin of the frænum. This is due to repeated friction from the lower central incisors and almost always indicates the presence of whooping-cough, during the spasms of which the tongue is frequently shot out over the lower incisor teeth. It may, however, occur in less severe forms of cough if the teeth are sharp; and even, rarely, with out any cough, in cases where the movements of the tongue in sucking are very energetic.



FIG. 40.—Whooping-cough in an Infant, aged 8 Months, with Congenital Syphilis. Ulcer under Tongue, Œdema of Eyelids, Depressed Bridge of Nose and Nasal Discharge.

The *strawberry tongue*, which is characteristic of scarlet fever about the third day and onwards, is sometimes of great help in the diagnosis of that disease. It is well, however, to remember that it is very often absent in scarlet fever, and that a typical strawberry tongue is sometimes seen in other conditions.

THE TEETH AND GUMS.

The examination of the teeth has been already discussed (chap. ii.) and the gums will be dealt with in speaking of stomatitis.

THE PALATE.

In many infants during the first few weeks, little yellowish white rounded nodules may be seen in the mesial line of



the hard palate. They vary in size from a pin's head to a millet seed, and are slightly raised above the level of the surrounding mucous membrane. These nodules are sometimes called "*epithelial pearls*," being composed of collections of epithelial cells, and they have no clinical significance. In rare cases, in unhealthy infants, they may ulcerate. When unusually large they may give rise to unnecessary anxiety, and have been mistaken for manifestations of congenital syphilis.

Abnormal vaulting of the palate may often be recognised in early infancy, but the deformity is never very great until after the second dentition. The significance of such peculiarities has been already alluded to (p. 159).

Perforations of the palate and of the pillars of the fauces are due to congenital syphilis in the great majority of cases, but occasionally may be caused by lupus, and rarely by diphtheria.

The palate should always be carefully examined in cases of suspected measles, as the *rash* generally appears there from twenty-four to forty-eight hours before it is recognisable on the skin. The rashes of scarlet fever and chicken-pox are also well marked in this position.

STOMATITIS.

Various forms of inflammation of the mucous membrane of the mouth are common in childhood, and they are of great importance, because they often give rise to a considerable degree of fever and other constitutional disturbance, and even in slight cases may interfere greatly with deglutition, and consequently with the nutrition of the child.

Forchheimer[1] classifies the different forms of stomatitis as follows:—(1) Stomatitis catarrhalis; (2) Stomatitis aphthosa; (3) Stomatitis mycosa; (4) Stomatitis ulcerosa; (5) Stomatitis gangrenosa; (6) Stomatitis crouposa (including Stomatitis diphtheritica); and (7) Stomatitis syphilitica.

1. **Catarrhal Stomatitis.**—Catarrhal stomatitis may be local or general. When local it is usually due to the mechanical irritation of a decaying tooth. When general it is probably to be attributed to micro-organisms, although various mechanical, chemical, and thermal influences may predispose to their action. Most authorities believe that stomatitis is much more likely to occur at the time of teething than at any other time, but this is denied by others.

The symptoms consist in swelling, pain, heat, and redness of the general mucous membrane of the mouth, with high temperature (sometimes even 104°) and the ordinary symptoms of febrile disturbance. The tongue is covered with a thick yellowish white fur. There is generally also increased secretion of saliva which runs out of the mouth, and some enlargement and tenderness of the lymphatic glands below the lower jaw.

The treatment consists in giving cold food if there is much pain, and in washing out the mouth with boric lotion (1 to 3 per cent.) or some other mild antiseptic solution.

In obstinate cases the mucous membrane should be painted once daily with nitrate of silver solution ($\frac{1}{2}$ to 1

[1] *The Diseases of the Mouth in Children* (non-surgical), Philadelphia, 1892.



per cent.) and 2 grains of chlorate of potash may be given internally every three or four hours.

2. **Aphthous Stomatitis.**—The etiology of aphthous stomatitis is not known, although various organisms have been described as its cause. It is regarded by Forchheimer and other authorities as not contagious, but it frequently occurs as an epidemic in several members of the same family.

The aphthae appear as little rounded ulcers, which begin as vesicles, and usually have a yellowish exudation about their edges. They vary greatly in number in different cases, and the amount of general stomatitis which accompanies them also varies much. If the general stomatitis is severe, there is usually a considerable degree of fever (102° to 103°). In some cases the ulcers are accompanied by little redness of the intervening mucous membrane, and in these cases there may be no general disturbance. There is usually a good deal of local tenderness and consequent interference with the feeding.

The local application of glycerine and borax, or permanganate of potash solution (1 to 1000), along with the internal administration three or four times daily of chlorate of potash (grs. ii.) and tincture of perchloride of iron (m. ii.) is usually rapidly followed by recovery.

3. **Parasitic Stomatitis.**—Parasitic stomatitis, or thrush as it is generally called, is due to the growth on the mucous membrane of an organism related to the yeast fungus, although there is still considerable difference of opinion as to its exact nature. It has been found that it is not an oidium as was formerly supposed, and it is now usually called *saccharomyces albicans*, although it is not quite

certain if it is of that genus. Whatever its exact nature is, its germs must certainly be widely distributed, judging from the frequency with which, under favourable conditions, it develops apart from any obvious source of infection. It is said that its germs may be found in the mouths of many healthy children. The normal movements of the healthy mouth are antagonistic to the growth of the fungus, which probably accounts in some degree for the fact that it is chiefly met with in infants during the first few weeks, and in older children who have been greatly weakened by disease.

The disease causes, at first, small white raised spots on the tongue and on the inside of the cheeks. These look like fragments of milk curd, but they cannot be removed without some force and, when rubbed off, leave an abrasion behind. In severe cases these spots spread until they form a more or less continuous false membrane, and this may even extend to the throat and in rare cases down the œsophagus. When a portion of the white patch is removed, treated with liquor potassæ and examined under the microscope, it is found to consist of the filaments and spores of the fungus along with epithelial cells, milk globules, bacteria, &c. There is generally catarrh of the mucous membrane between the patches.

The treatment consists in removing the spots gently by means of a soft rag moistened with bicarbonate of soda solution (1 dr. to 5 oz.) and in applying to the raw surface a solution of permanganate of potash (1 to 1000) or glycerine and borax. Everything that comes near the child's mouth, or has to do with his milk, must be carefully cleansed so as to avoid re-infection, and the



general debility which is always present must be carefully treated.

4. **Ulcerative Stomatitis.** — No special organism has been discovered to account for ulcerative stomatitis. It is caused by mercurial, lead, and phosphorus poisoning, and is a symptom of scurvy; but, in the great majority of cases, it is due to other as yet undiscovered causes. It may occur as a sequel of infectious illness, and it is a frequent complication of various chronic diseases. It is rarely found except in conditions of debility, and is seldom seen in early infancy, the patient being generally between five and ten years of age.

The ulceration begins on the alveolar margin of the jaw close to the teeth and spreads to the neighbouring parts. It is never found where there are no teeth. The gum round the sores swells greatly, and the affected area may be very tender. If the case is neglected, the teeth may loosen and drop out and the jaw may even become necrosed. The patient has a cachectic appearance and the glands below the jaw are usually enlarged. There is constant trickling of saliva from the mouth, and it is often stained with blood. The tongue is covered with a dirty brownish yellow fur, and there is always an extremely offensive odour from the breath.

When the affection is due to scurvy or to poisoning, the treatment of these conditions requires, of course, immediate attention. Under ordinary circumstances, however, as we do not know the main cause of the disease, we have to confine ourselves mainly to the treatment of the local condition. For this, local and internal remedies are used. For internal use chlorate of potash is of the greatest value,

and 2 grains of it may be given along with 2 minims of tincture of perchloride of iron every two hours. The child should also be made to wash out his mouth, at short intervals, with a weak solution of permanganate of potash (a teaspoonful of the liquor to a small cup of water) or a stronger solution may be used (1 to 1000) to paint the gum. The patient's nutrition and his hygienic surroundings must be improved, if possible, and precautions taken against infection, as the disease is probably capable of spreading by contagion.

It is important to remember that chlorate of potash is a remedy which requires to be given with caution to young children. In the doses recommended above it is free from danger, but if large doses are administered for some time there is risk of poisonous symptoms occurring. The first of these are drowsiness and diminution in the quantity of the urine.

5. **Gangrenous Stomatitis.**—Cancrum oris, or noma, is fortunately a rare disease. It usually occurs in children whose vitality has been very much lowered by one of the infectious diseases, especially measles; and it is probably due to the action of a special micro-organism.

The disease commences as a small red patch on the gum, or on the cheek near the angle of the mouth, which rapidly spreads and soon assumes the characteristics of moist gangrene, destroying all the tissues affected. In the great majority of cases, the child dies in a state of collapse or from septicæmia or pneumonia. Occasionally recovery takes place with, or rarely without, treatment, and great deformity is always left. In girls, noma is sometimes met with on the vulva.



The treatment consists in a very thorough application of Pacquelin's cautery, pure carbolic acid or some other caustic.

6. and 7. **Diphtheritic and Syphilitic Stomatitis.**—These need not be specially described here.

CATARRH OF THE PHARYNX AND TONSILS.

Although sore throat may be present at any age, it is not so common in infants as in older children. When it occurs in infancy, its presence is usually first recognised by the child refusing his food or showing symptoms of pain on swallowing.

In older children, slight degrees of catarrhal sore throat often give rise to a persistent cough as the most prominent symptom.

The recognition of acute sore throat is generally easy if the fauces are inspected; but a diagnosis of its nature must be made with caution, as the presence of a sore throat with fever always suggests the possible commencement of one of the infectious diseases, especially scarlet fever, diphtheria, enteric fever, rötheln, measles or influenza.

In older children, acute tonsillitis is not infrequently a manifestation of rheumatism, and the heart should always be carefully watched during an attack, as it is occasionally associated with endocarditis. When several children in a household suffer from sore throat, the condition of the drains should always be investigated.

The treatment of sore throat in children does not differ from that in adults. In acute cases it is generally desirable to begin with a mercurial purge, and this has often a marked

effect in relieving the throat condition. Small doses of tincture of guaiacum or of chlorate of potash may be given, and, in possibly rheumatic cases, salicylate of soda.

CHRONIC ENLARGEMENT OF THE TONSILS.

This condition is very common even in early childhood. It gives rise, in many cases, to a certain amount of deafness or earache; and, if it resists the use of astringent and stimulant applications (F. 8 and 9), it should certainly be subjected to operation.

ADENOID GROWTHS.

Even in early infancy, adenoid growths may be present. The number of children in whom they are found is very large, but it is only in a proportion of these that an operation is required. The change which their presence produces in the face has been already referred to (p. 51, Fig. 10).

Operative treatment may be indicated by the degree of nasal obstruction which the growths occasion, with consequent facial deformity and possible reflex disturbances; or it may be rendered desirable by the liability to recurrent catarrh of the throat which their presence causes, and the tendency which this shows to spread to the ears or to the air-passages.

RETRO-PHARYNGEAL ABSCESS.

In examining children with dyspnœic symptoms or sore throat—especially those under two—it is important to remember the possibility of retro-pharyngeal abscess. It



is not a common condition, but its recognition and proper treatment are of great importance.

Chronic abscesses in this situation are usually the result of *tubercular disease* of the cervical vertebræ, and the pus is situated between the bone and the prevertebral fascia. In *acute* cases the abscess develops in front of the prevertebral fascia and pushes the posterior pharyngeal wall before it so that it bulges into the back of the throat, interfering with deglutition and respiration. It is generally due to infection of the lymphatic glands by *pyogenic organisms* from the throat or elsewhere. It is the acute or sub-acute cases to which the following remarks apply.

The onset of the *symptoms* is usually insidious. The child is restless, and sometimes refuses his food, and seems pained when drinking. There may be some stiffness of the neck. The breathing early assumes a snoring character, especially when the child is asleep, but generally it is ten or fourteen days, according to Henoch, before the abscess is sufficiently large to cause interference with breathing. Gradually the respiration becomes more and more difficult and stridor accompanies both inspiration and expiration. The breathing is worse when the child is laid down. When the patient attempts to drink he is apt to choke, and the fluid is coughed out of his mouth and nose. Generally neither hoarseness nor cough are present, but this is not always so, as the condition may be accompanied by laryngeal catarrh. Occasionally there is marked external swelling in the neck. The only certain means of diagnosis, however, is digital exploration of the pharynx, which at once reveals the presence of the abscess, even when it cannot be diagnosed by inspection.

The *treatment* consists in immediate incision of the abscess. In most cases this is best done through the mouth by means of a tenotomy knife, the child being laid on his face immediately after the incision, so that he may cough out the pus. Large abscesses may have to be opened through the neck.

THE LARYNX.

In young infants, it is only exceptionally that the vocal cords can be clearly seen even by expert laryngologists; and in most cases a view of the epiglottis is all that can be obtained. The infant's epiglottis is more folded than the adults, so that its lateral margins come nearer to one another.



CHAPTER XII.

ON INFANT FEEDING.

BREAST FEEDING.

DURING the first seven to nine months of a child's life, he should draw his nourishment solely from his mother's breasts, and till the end of the tenth or even twelfth month, if all goes well, the breast milk should form the main part of his food. The mother's milk is the most digestible as well as the most perfectly nourishing food a child can have. When a delicate baby is deprived of breast milk and put on the bottle, he is exposed to certain additional risks, and this should therefore never be done without careful consideration. If the child is strong, it is less important; but if he is specially weakly (*e.g.* atrophied, syphilitic) breast feeding may give him his only chance of life.

Unfortunately, however, there are circumstances which may arise to prevent the possibility or desirability of breast feeding. There are, for example, a large number of apparently healthy women who have *no milk* for their children. In other cases nursing may have to be forbidden, either because the *mother is so delicate* that the additional strain which it causes would be too much for her, or because she has *tuberculosis* and the close contact which nursing implies would expose the baby to the risk of infection with that disease. Further, the mother may have to give up nursing

owing to an *abscess of the breast* or some other local or general disease.

Nursing.—The new-born child should be put to the breast three or four times during the first two days. The small quantity of colostrum which he obtains is good for him as a laxative, and the process by which he obtains it is good for the mother, stimulating the uterine contractions and also conducing to the further secretion of milk. It is not advisable to begin feeding a healthy infant before the third day of life. Nature intends that his digestive organs should have a rest until the breast has prepared suitable food for their use. The administration of laxatives, carminatives or other medicines at this time is also uncalled for and usually does nothing but harm.

On the third day and thereafter for four to six weeks, the breast should be given at regular intervals of two hours, except at night when a sleep of four hours should be allowed, and this after the first month may be extended to six hours. After the first six or eight weeks, the intervals during the day time may be lengthened to three hours. The three hours intervals may be continued while the child is at the breast, but as he gets older he will take a longer sleep at night.

HUMAN MILK—ITS COMPOSITION AND CHARACTERS.

In order to remember and appreciate the composition and characters of human milk, it is best to compare them, one by one, with those of cow's milk which are more familiar.

1. **Composition.**—The average composition of human milk and cow's milk may be stated as follows:—

	Human Milk.	Cow's Milk.
Water . .	87-88	86-87
Fat . .	4·	4·
Albuminoids .	1·-2·	3·-4·
Milk-sugar . .	7·	4·5
Ash . . .	0·2	0·7

The most important difference between the two kinds of milk lies in *the different character and amount of their albuminoid constituents.* In both, this consists mainly of casein and lactalbumin (which resembles serum-albumin). The casein is precipitated by acids and not by boiling—the lactalbumin by boiling and not by acids. In cow's milk, according to Prof. Leeds,[1] the casein is to the lactalbumin in the proportion of four to one, while in human milk it is only as one to two. The result of this (combined with the difference in the percentage of the albuminoids) is that on the addition of dilute acid to the cow's milk the greater part of the albuminoid is precipitated in the form of heavy cheesy masses.

Human milk when treated in this way gives a precipitate composed of a relatively small part of its proteid, and this is in the form of finely divided and therefore easily soluble flakes. Thus, if one takes "equal parts of the two secretions, the coagulum of woman's milk is but one-fifth as much as that of cow's milk." The total amount of the albuminoid constituent in cow's milk, is from two to three times as much as that in human milk.

The percentage of *butter* in the cow's milk which is obtained in towns is very apt to fall below four, and may be under three per cent. There is said to be no important

[1] "The Chemistry of Milk and of Artificial Foods for Children." *Starr's Text-book of the Diseases of Children*, 1894, p. 46.

difference in the character of the fatty constituents in the two kinds of milk. While the quantity of *milk sugar* in the two differs, its composition is exactly the same in each. Cow's milk contains a much larger proportion of *salts*. Thus for example there is four times as much phosphate of lime in it as there is in human milk.

2. **Reaction.**—Human milk is slightly alkaline. Cow's milk, by the time it is available for feeding purposes, is always distinctly acid.

3. **Sterility.**—Human milk is practically sterile as it leaves the nipple. Cows' milk, on the other hand, when delivered for use contains a large number of bacteria.

4. **Antiscorbutic properties.**—The milk of healthy women (like fresh cow's milk and unlike condensed milk), contains the antiscorbutic principle, so that infants fed upon it will not take scurvy.

CAUSES OF BREAST MILK DISAGREEING.

Sometimes the breast milk does not agree with the child. He either does not thrive as he should do or he is uncomfortable and shows other signs of dyspepsia. This may be due to a variety of causes.

The mother may not be *attending as she ought to her own health or diet.* She may for some reason be over-anxious or excited and this may interfere with the function of the breasts so that the milk is quite abnormal in composition for the time. In such a case, with the restoration of mental tranquillity, the milk will often recover its normal characters. Again, certain articles of diet cause the milk of some women to become temporarily unwholesome, and when these are discontinued it returns to its normal condition.



A very important and common cause is the *irregular and too frequent giving of the breast.* This is bad, not only because it gives the infant's stomach no rest, but also because, when the breasts are stimulated to secrete at too short intervals, the milk produced is abnormal and difficult of digestion. Milk secreted under these conditions contains an abnormally large amount of solids, especially of casein. If the intervals between nursing are too long, on the other hand, the milk is watery and unsatisfying.

3. Other causes connected with the *mother's usual diet and habits* may render the milk indigestible by altering the proportion of its constituents. Thus there may be a great increase in the proteids, or a diminution or excess in the quantity of cream. The amount of milk-sugar rarely varies much.

Faults in the composition of the milk may prove incurable, but they may often also be remedied by diet and exercise. Increase in the proteid in the mother's food tends to increase the cream in her milk as well as its proteid; while regular exercise may greatly diminish the albuminoid element in the milk, without affecting the other constituents.

If the mother has some milk in her breasts, but not enough to fully nourish the child, it is generally advisable for her to give what she has, and to supplement it by bottle feeding. What she can give is usually a gain to the child, and the secreting power of the breasts may increase with use.

Even although a mother has plenty of normal milk it is a good plan to give the baby one bottle in the day. This is not only a welcome relief to the mother but it accustoms

the infant to the use of the bottle, and this may be an advantage afterwards should anything interfere with the continuance of the nursing.

WEANING.

If the mother is strong and well, and the child thriving, it is advisable to continue the nursing for ten or even twelve months, although after the seventh month the breast milk may require to be supplemented by some other food. The process of weaning should take place gradually, occupying about three or four weeks, so that the infant's stomach may have time to accommodate itself to the change of food. Sometimes, however, the baby will utterly refuse the bottle so long as he gets any breast milk, and in these cases it may be necessary to stop giving the breast at once and altogether.

WET-NURSING.

When the mother is unable to suckle her child, she must either get a wet-nurse or begin hand feeding. From a theoretical point of view the former plan is the best; but for various practical reasons, wet-nurses are rarely employed nowadays in this country for healthy children. They are not only difficult to find and expensive to keep, but the circumstances which induce them to offer their services are often such as to render them undesirable inmates of a house.

While, however, wet-nurses can only occasionally be made use of, it must always be remembered that no form of artificial feeding, however skilfully planned and carefully



carried out, is quite so good for weakly children as suitable wet-nursing. Although therefore wet-nursing is usually unnecessary in ordinary cases, many infants who are dying of atrophy or from the exhaustion caused by severe diarrhœa or other disease, may be saved by wet-nursing and by nothing else. Where the infant is too weak to be able to draw the milk from the wet-nurse's breast, it should be drawn off for him by a breast pump and given through a bottle or with a syringe.

HAND FEEDING.

In practice among vigorous country people in a cool climate and with healthy surroundings, the subject of the artificial feeding of infants is one which requires but little trouble or thought. Among the anæmic and sickly inhabitants of towns, however—even in this climate, and still more in warmer ones—there are few more important problems than hand feeding. A large proportion of the young children met with in general practice are suffering from the results of improper feeding, and the regulation of their diet forms the main, and in most cases the only, necessary part of the treatment.

THE FEEDING BOTTLE.

The bottle used in feeding the child should be as simple in form as possible—a plain cylindrical flask with no angles in it. It should hold from eight to ten ounces and it is an advantage to have it graduated in half ounces. It should have no cork or tube connected with it and should be provided with a plain conical rubber nipple which will fit over its neck and is wide enough to be easily turned inside

out and scrubbed with a nail brush. The opening in the nipple should vary in size according to the strength of the child. Generally speaking it should be large enough to allow the milk to drop through it readily when the bottle is turned upside down, but not so large as to let it run from it in a stream. It is well to have two bottles and two nipples so that they can be used alternately.

The bottles which have the nipple situated at the end of a long rubber tube, with a glass tube hanging inside, are in almost every way objectionable. It is practically impossible to keep them perfectly clean and they encourage ways of feeding the child which are bad for him, however they may save the mother's time. A good form of bottle has been recently devised which has an opening at both ends, so that a stream of water can be run through it for cleaning purposes.

THE USE OF THE BOTTLE.

When feeding an infant from the bottle, the mother or nurse should sit down and give the same attention to the process as she would to that of suckling. The milk should be given at about the temperature of the body. The child should be allowed fifteen or twenty minutes for his meal, and then the bottle should be taken from him. Regularity in the times of the meals is as important as in the case of breast feeding and the intervals should be the same (p. 186).

When the meal is over, the bottle must at once be emptied and (with the nipple) cleansed thoroughly with soap and hot water and put to soak in a saturated solution of boracic acid or a weak solution of permanganate of potash until required again. In hot weather, the bottle should be sterilized by placing it in boiling water for twenty



minutes before it is used again. No milk which has remained for some time in the bottle should ever be given to a child; and it is important not to allow a drop of milk to dry on the glass inside the bottle as it is very difficult to remove thoroughly. The rubber teats should be frequently renewed, as they are apt to get cracked, and then it is impossible to keep them thoroughly clean. The importance of keeping the feeding-bottle free from sourness cannot be over-estimated. A single bottle of sour milk will often cause an attack of dyspepsia which lasts for weeks, and may even end fatally.

The baby *should not be allowed to suck the nipple of an empty bottle*, and the constant sucking of a solid india-rubber teat, which many nurses favour as a means of keeping the child quiet, should be discouraged as a bad habit. In certain exceptional cases, however, the temporary use of a contrivance of this kind may be of great use in soothing an irritable child whose condition makes it imperative that he should be kept from crying.

The **quantity** of milk to be given must vary to some extent according to the individual child, and if he is healthy it may be left a good deal to his appetite. It is well, however, to have some idea of the amount an ordinary child requires at different ages, because he may suffer from habitually taking too little; and, on the other hand, as happens more frequently, he may be made ill by being given too much.

The following table gives what may be regarded as the minimum amount of *breast milk*, or its equivalent, to be taken at each feeding and during twenty-four hours, respectively, by an average infant at different ages. If

the food given is much diluted, larger quantities will be required.

Age.	*At each feeding.*	*In 24 hours.*
1 week	1 oz.	10 to 15 oz.
1 month	2 oz.	1 pint.
5 months	4 oz.	1½ pints.
9 months	7 oz.	2 pints.

CHOICE OF SUBSTITUTE FOR THE MOTHER'S MILK.[1]

In choosing a substitute for the mother's milk, the main object is to obtain a food which shall be as like the breast milk as possible. That is *the only perfect infants' food*, and it is by studying its composition and characters, that we find out how best to supply its place. All the substitutes devised for it are but imperfect imitations of the original, and are always apt to cause more or less dyspepsia, at first. The more the food given approaches the mother's milk in all particulars, the less will the indigestion be, and the sooner will the child's digestion adapt itself to it. In strong healthy infants there is an immense reserve power, so to speak, of digestion, so that they can become used to food which differs very much from breast milk, but, in weakly infants, it may require the greatest care to devise anything sufficiently like it to agree with them.

In considering any proposed substitute for mother's milk we have to look, not only at its *chemical composition* and possible *nutrient value*, but also specially at its *digestibility*;

[1] For an excellent account of recent experiences in infant feeding see *The Natural and Artificial Methods of Feeding Infants and Young Children*, by Edmund Cautley, M.D., London, 1897.



and we may have to consider also the amount of *trouble and expense* involved in its preparation.

FRESH COWS' MILK.

Fresh cows' milk is more used than all other substitutes for breast milk put together, and for most cases it is far the best. For ordinary purposes, the mixed milk of a good dairy should be used, as it is much more likely to be uniform in composition than the milk of one cow. Cows' milk differs, however, as we have seen, from breast milk in several important particulars, and it has therefore to be modified in various ways to make it suitable for the infant's use. Thus it differs in composition in containing too much albuminoid and saline matter; this is obviated by dilution. When diluted, it contains too little butter and far too little lactose; these defects are met by adding cream and sugar. Again, for its acid reaction, an alkali should be added; and, on account of the numerous micro-organisms it contains, it must be sterilised.

MODIFICATION OF COWS' MILK.

We may now consider those modes of treating cows' milk one by one, and then see what combination of them is likely to give the best results.

(*a*) **Dilution.**—Dilution with water, with the addition of sugar, is the mode of preparing cows' milk that is most widely used, and it often does very well for strong children with a good digestion. Mere dilution, however, makes a food which is very unlike human milk in its composition.

The proportion of water to be used must depend upon

the amount of casein the child is able to digest. Thus, during the first six weeks of life, two, if not three, parts of water to each part of milk must often be used. After that, equal parts of milk and water till the fourth or fifth month; then two parts of milk to one of water till the eighth or ninth month; after this the strength of the mixture may be gradually increased until by the end of the first year the baby is taking pure milk.

The dilution of the milk with *barley water* or some other farinaceous or gelatinous decoction (See Appendix D) instead of with plain water, has been much used, and certainly milk so prepared is often more readily digested. This fact used to be explained by the supposition that the particles of the farinaceous substance get between the particles of curd, and thus prevent its being so dense as it would otherwise be. Some recent writers, however, deny this altogether. Barley water, as may be seen from its composition, is practically of no use as a nutrient.

ANALYSIS OF BARLEY WATER (WYNTER BLYTH).

Water	99·27
Fat	0·02
Albuminoids	0·03
Starch	0·39
Sugar	0·05
Mineral Matters	0·03

When it is being used, it is important to see that it is made, at least, twice a day as it does not keep well, and, if sour, is sure to disagree with the infant.



(*b*) **Addition of Sugar.**—The sugar used in infant-feeding should, if possible, be milk-sugar; but if reliable milk-sugar cannot be obtained, white cane-sugar does well enough. Brown sugar should not be used, as it is apt to cause dyspepsia and griping. The amount of milk-sugar added should be sufficient to bring the percentage to about that of human milk: this is easily calculated approximately from the average analysis already given (p. 187). When cane-sugar is used, rather less may be given.

(*c*) **Addition of Cream.**—Cream is, of course, merely milk which contains a greatly increased percentage of butter.

The following analysis of ordinary weak cream is given by Meigs:—

Water	79·12
Fat	13·36
Albuminoids . . .	2·92
Milk-Sugar . . .	4·14
Ash	0·46

It may be obtained by skimming the milk which has stood for some time, or by the use of a centrifugal separator. That prepared in the latter way has the advantage that, as it can be much more rapidly obtained, it is less likely to be sour. It can also be obtained of a known richness. Ordinary cream as sold in town dairies has usually a percentage of butter of between 12 and 17. Centrifugal cream can be got with 8, 10, 20, or even as much as 35 or 40 per cent. of butter.

(*d*) **Addition of an Alkali.**—Lime water is the form in which the alkali is usually given, and, as it only contains

half a grain of lime to each ounce, it must be given in considerable quantity. In ordinary cases, where it is merely desired to neutralise the acidity of the cows' milk and to render it slightly alkaline, from one-sixteenth to one-eighth of the mixture should be lime water. In certain forms of illness, in children as in adults, we may have to give a much larger proportion of alkali in order to neutralise the acidity of the gastric juice.

A solution of bicarbonate of soda (1½ gr. to 1 oz.) may be used in place of lime water and in the same quantities; or about half as much fluid magnesia.

(*e*) **Sterilisation.**—Normal cows' milk is a sterile fluid originally, but, as it comes from the udder at the beginning of milking, it contains a few micro-organisms which have found their way into the ducts. When treated as it ordinarily is in the process of milking, it rapidly becomes contaminated by organisms from the milker's hands, the cow's body and its various unclean surroundings, and soon—especially if it is allowed to cool slowly—these multiply very rapidly. Thus when the milk is obtained for feeding purposes it is found to be swarming with a variety of micro-organisms. It may contain tubercle bacilli, if from a tubercular udder, or it may convey the infection of enteric or scarlet fever or some other infectious disease. Apart, however, from the action of such pathogenic organisms, we find that there are many others in unsterilised milk which are apt greatly to increase the difficulty of its digestion and to give rise to many forms of dyspeptic disturbance. Professor Soxhlet found that calves a few days old got diarrhœa whenever they were taken from the udder and fed with their mother's milk out of a trough, and that this stopped

when they were put back to the udder. Efficient sterilisation will in many instances enable even a delicate child to thrive on a milk food which is far from being suitable in other respects in its composition.

It is probable that in the future the practical results of bacteriology will come to exert a greater influence than at present in the ordinary dairy and dairy farm, and that a degree of care and cleanliness will then be introduced into their operations which are at present unknown. When that time comes the habitual sterilisation of the milk used in infant feeding may be unnecessary. In the meantime, it is certainly desirable that all the milk used in feeding infants, in towns, should be carefully sterilised by boiling or steaming.

Boiling.—The simplest way of sterilising milk is to boil it in an ordinary pan over a fire or spirit lamp; but it is apt in this way to be burned. It is better therefore to place the milk in a porcelain vessel inside a pan containing water, as over-heating will then not be so likely to occur.



FIG. 41.

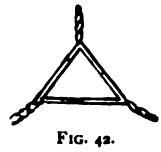


FIG. 42.

The most satisfactory vessel that I know of for boiling milk was recommended to me by Dr R. M. Ronaldson. It consists of an ordinary Bohemian glass flask (Fig. 41) stoppered by a large plug of sterilised cotton-wool. It is set in a saucepan containing water and rests on a triangle of iron wire (Fig. 42), which allows the escape of steam from under it. When the infant is to be fed, the plug of wool is removed while the necessary amount of milk is poured into the feed-

ing-bottle, and then at once replaced in the neck of the flask.

In the hands of cleanly and careful people, in a cool climate, this simple method of boiling the milk is quite satisfactory; and the apparatus is very inexpensive and easy to keep clean.

The supply of milk must of course be sterilised while it is fresh. If it is allowed to stand until it gets sour, no amount of boiling will render it wholesome. It should also, after boiling, be allowed to cool rapidly, carefully protected from the air, and kept at a low temperature,

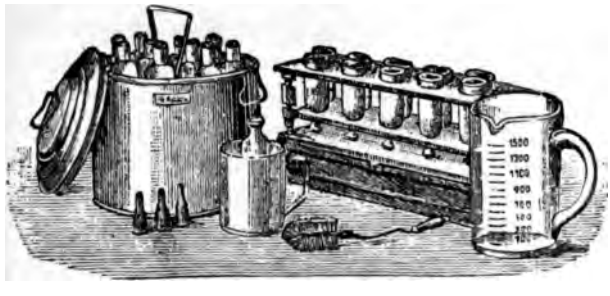


FIG. 43.

otherwise it will rapidly become reinfected with micro-organisms.

Sterilisers.—In hot weather and when great care in the handling of the milk cannot be guaranteed, it is best to use a regular steriliser. Of these there are many excellent forms; the two following may be described as typical.

Soxhlet's Steriliser (Fig. 43) consists of the following articles:—

1. A number of thin glass flasks.



2. A large covered tin pan in which these can be surrounded by water and boiled.

3. A tin holder for lifting the flasks into and out of the pan.

4. A wooden rack, with a zinc dripping pan, in which the spare bottles are placed and which contains a drawer for extra corks, teats, &c.

5. A small double-bottomed tin mug in which the flasks are warmed before use.

6. A graduated glass beaker with a handle, for mixing the milk, water, &c. in the proportions required.

7. Rubber discs for closing the bottles and small metal caps to hold them in position. (Sometimes perforated rubber stoppers are used into which small glass rods fit.)

8. Rubber teats, and a few bristle brushes for cleaning the bottles.

Directions for use.—Sufficient milk for the day's use is modified by the addition of cream, sugar, &c., and ten of the flasks are filled with it, up to within half an inch of the neck. The flasks are then arranged upon the holder, a rubber disc being put upon the mouth of each with a metal cap to keep it in position. The holder is placed in the tin pan which is filled with cold water up to the level of the milk in the flasks. The cover is then put on, and the pan placed on the fire and allowed to boil for forty-five minutes. (If the rubber corks and glass rods are used, the former only are inserted at first, and after the water has boiled for five minutes, the pan is taken off the fire and the glass rods put in.)

The pan is then taken off the fire, the lid removed and

the flask holder lifted out. As the flasks cool, the rubber discs are forced inwards by the atmospheric pressure, so that their upper surface becomes deeply concave, and the flasks are thus hermetically sealed.

When required for use, a flask is warmed to blood heat in the tin mug. The disc is removed by raising its edge a little, and one of the rubber teats is fitted on the neck of the bottle.

Soxhlet's Steriliser is a very satisfactory one; it is easy to manage, and milk prepared in it will keep sweet for from four to six weeks.

Cathcart's Steriliser (Fig. 44) consists of a cylindrical block-tin vessel, tapering slightly towards the base, which fits easily into an ordinary pan. It is furnished with a nickel-plated tap through which the milk is drawn off. The lid fits tightly, and, when sterilisation is completed, the line of juncture between it and the can is rendered air-tight by slipping an elastic band over it. In the centre of the lid there is a funnel-shaped aperture which is plugged with cotton wool and through which the handle of the stirrer projects. The stirrer consists of a metal rod to which a screw-shaped piece of tin is attached. Its lower end rests in a small depression on the bottom of the vessel, while its upper end reaches far enough beyond the top of the lid to be rotated by the forefinger and thumb.



FIG. 44.—Cathcart's Milk-Steriliser.



Directions for use.—The milk for the day is mixed and poured into the vessel, which is then placed in a pot about a quarter full of boiling water. The pot is kept boiling over a good fire for twenty minutes, at the end of which time the vessel is lifted out, the rubber band adjusted over the edge of the lid, and a plug of clean cotton wool placed round the handle of the stirrer, in the top of the funnel.

The vessel is set aside in a cool place, and each bottleful of milk is drawn off from the stop-cock as required, the contents of the vessel having been first thoroughly mixed by rotating the handle of the stirrer.

Cathcart's Steriliser is a simpler and much less expensive apparatus than Soxhlet's. It is therefore specially adapted for use among the poor, and when carefully managed is very efficient.

Pasteurisation.—Boiling the milk or heating it to nearly boiling point has certain disadvantages. It gives it a somewhat disagreeable taste and smell; it coagulates the lactalbumin, making it less nourishing; and it interferes with the antiscorbutic properties.

Pasteurisation is a modified method of sterilisation which is said not to be open to those objections. It consists in heating the milk for from ten to twenty minutes at a temperature of 167° F. This appears to be sufficient to render innocuous the germs of enteric and scarlet fever, and those which give rise to some forms of diarrhœa, but it is doubtful whether it protects from tuberculosis.

To pasteurise milk in Soxhlet's apparatus, about an inch of water should be placed in the vessel, and the boiling continued for only twenty minutes with the lid loosely fitted on.

COMBINATIONS OF THESE METHODS FOR PRACTICAL USE.

Having considered then the various ways of altering raw cows' milk to make it liker breast milk in each particular, we now come to consider which is the best combination of these for practical use.

In the case of strong healthy children whose mothers are unable to give much time or intelligence to their feeding, suitable dilution of fresh cows' milk, with the addition of white sugar, often does very well. Boiling, and the addition of lime water and cream in proper proportions, can usually be managed, and it is a great improvement. When, however, the mother or nurse is willing to give a little care and time to the preparation of the food, it is much better to try to prepare a mixture which shall as far as possible resemble human milk—"artificial human milk" it is sometimes called.

Artificial human milk can be procured ready made and sterilised, from various large Dairy Companies. This is convenient for those who live in their vicinity, but has various disadvantages, besides that of expense, for those who are at any considerable distance from them. There have also been devised a considerable number of ways of making artificial human milk at home. Those of which I have had most practical experience are the methods recommended by Frankland, Meigs and Rotch.

Frankland's method consists in adding to cows' milk certain proportions of whey, cream and milk-sugar. The process is troublesome and takes so long that, in summer weather, it is almost impossible to keep the mixture from



turning sour. The proportion of casein is also too high. I have not found the results of this method to be satisfactory and do not therefore give the details of the process.

Meigs' first published method of preparing artificial human milk, or "Cream Mixture" as some call it, was as follows:[1]—

Packages of milk-sugar are obtained containing each 17¾ drachms, and one of these is dissolved in 16 ounces of water when required to make "sugar water." To prepare the bottle the following proportions are taken:—

Ordinary average Cream (16 per cent.)	2	tablespoonfuls.
Milk	1	,,
Lime Water	2	,,
Sugar Water	3	,,

A glass or tin measure can easily be obtained which holds about 17¾ drachms of sugar of milk and obviates the necessity of weighing it out. The lime water should be added after the mixture has been sterilised or a certain amount of discoloration will take place. Meigs' mixture is easily prepared, and in the large majority of cases gives excellent results. In prescribing it, we have constantly to warn the mothers only to use ordinary cream, as they are always inclined to try to improve it by using thicker cream, and are apt in this way to set up indigestion.

More recently,[2] Dr Meigs has recommended the following simpler procedure. A quart of good milk is poured into a tall vessel, and allowed to stand for three hours in a cool

[1] *Milk Analysis and Infant Feeding*, Philadephia, 1885.
[2] *Archives of Pediatrics*, Dec. 1889, p. 838.

place. Half of the quantity is then gently decanted into another vessel without shaking. This contains, of course, a large proportion of the cream; and, when 1½ ounces of it is mixed with 1 ounce of lime water and 1½ ounces of sugar-water (sugar of milk 18 dr., or 8 heaped teaspoonfuls, to 16 ounces of water), the result forms a useful mixture.

Rotch's mixture, recommended in his article on "Infant-Feeding" in *Keating's Cyclopædia*, is very simply prepared and differs from Meigs' mixture mainly in containing less lime water. It is as follows:—Mix the day's supply of milk as soon as it is received in the morning in the following proportions:—

Cream (20 per cent. fat).	1½ oz.
Milk	1 ,,
Water	5 ,,
Milk Sugar . . .	3⅜ dr. (*i.e.* one measure)

steam in a bottle for twenty minutes, the mixture being introduced by means of a funnel in order that the neck of the bottle shall be kept dry. The bottle is to be stoppered tightly with a cotton plug. After steaming, remove the bottle immediately and allow it to cool partially, then add half an ounce of lime water and keep on ice.

The methods of Drs Meigs and Rotch can be carried out satisfactorily by any moderately intelligent woman, and they are exceedingly useful. Dr Rotch has recently published an improved method, but as it is rather elaborate I must refer you to his book for its details.

Although the routine prescription of any good formula of artificial human milk may be, and in fact is, a great improve-



ment on giving simple mixtures of milk and sugar and water, it is far from being the ultimate ideal in infant-feeding. The experience of those who have much to do with the modification of cows' milk for delicate babies soon shows that the idiosyncrasies of different infants, and their individual capacity for digesting the various constituents of the milk, have to be observed and acted on before the full advantages obtainable from artificial feeding can be arrived at. This can only be done with freedom and accuracy where (as in the large towns of America and in London) there are properly equipped Milk Laboratories, where any prescription of a milk-mixture can be made up to order. A certain degree of variation, however, for individual peculiarities is quite possible without these institutions, especially if cream of a known richness can be obtained.

M. Budin's method of infant-feeding[1] has attracted much attention lately. It consists in giving to the child ordinary undiluted cows' milk which has been sterilised by boiling for forty minutes in a Soxhlet's Steriliser. To infants during the first month he gives eight bottles of two ounces each in the day. The experience of Budin and Chavane as to the digestion of pure sterilised milk by babies differs considerably from that of many observers in other countries. They find that not only does the pure sterilised milk not cause indigestion, but that any dilution of it with water at once causes it to disagree with the child.

While I cannot speak very favourably of this mode of infant-feeding from the little personal experience of it I have had, and should not have expected that it would often succeed, I know that it has been used with success, in a

[1] *Bulletin de l'Académie de Médecine*, 1893 and 1894.

large series of cases, by my friend Dr Milne Murray and others. Its extreme simplicity is a great advantage, and it is certainly worth a careful trial.

INDICATIONS FOR SPECIAL MODIFICATION OF THE MILK.

The indications that the amount of either butter, sugar or proteid in the milk given is out of proportion to the needs or digestive powers of the child are not always easy to make sure of. Dr Holt mentions the following:—If there is too little sugar, the child's gain in weight will be too slow. Should there be too much, colic may occur, or there may be thin, green, very acid stools, which sometimes cause irritation of the buttocks. Sometimes also there is eructation of gas and regurgitation of small quantities of food.

Too little fat is usually indicated by constipation with hard dry stools, although this condition may be due to quite different causes. Excess of fat is indicated by frequent regurgitation of food in small quantities, usually one or two hours after feeding. It is sometimes shown by frequent motions which are nearly normal in appearance. In some cases the excess of butter forms little rounded masses which look like curd in the stools.

The most reliable indication of the excess of proteids is the presence of undigested curd in the stools. This is a frequent cause of colic in infants. Sometimes there is diarrhœa but more often constipation. Vomiting and regurgitation of small quantities of food are also sometimes caused by too much proteid.



PEPTONISED MILK.

The methods of preparing peptonised milk, either by Benger's liquor pancreaticus or by Fairchild's peptonising powders, are too familiar to be detailed here. Peptonised milk is a very valuable preparation for certain forms of dyspepsia and debility in infancy. It should not, however, be used regularly for healthy children, as the digestive powers are apt to suffer from want of use when it is given for long. The anti-scorbutic element also is deficient in fully peptonised milk, so that children fed on it are apt to get scurvy.

There is less objection to milk which is only partially peptonised. This is easily effected by any method of peptonising. A convenient way is that recommended by Prof. Leeds[1] in the making of what he calls "humanised milk"—that is milk pasteurised, and partially digested by the use of Fairchild's "Peptogenic Powder." The advantage of partial digestion is that the coagulable albuminoid present is greatly diminished by it, so that the drawback of the large quantity of casein in the cows' milk is obviated considerably. The method of preparation is simple, and a paper describing it fully is given with each bottle of the "Peptogenic Powder." Milk prepared in this way is sometimes very useful for delicate infants.

CONDENSED MILK.

Condensed milk is useful in its own place, but for the ordinary purposes of feeding infants it is not to be regarded as equivalent to properly prepared fresh cows'

[1] *Loc. cit.*

milk. There are many varieties of condensed milk in the market—sweetened, unsweetened, and peptonised; here, however, we shall only deal with the sweetened varieties, as they are much more used than the others. The worst of them are manufactured from skimmed milk. The following analysis of an ordinarily good variety of condensed milk is given by Meigs :—

	Undiluted	As ordinarily used—diluted.
Water . . .	27·942	92·673
Fat . . .	10·335	1·095
Casein . . .	9·522	·868
Sugar . . .	50·861	5·206
Ash . . .	1·340	·158

The composition of the different brands varies a good deal, but even in the best of them when diluted as much as they usually are, there is too little albuminoid; and in all there is far too little cream. The statement commonly made, that there is a large excess of sugar in them, seems to be a mistake.

Mode of Preparation.—The water used in diluting condensed milk should be boiled and filtered. The proportion of milk to water should be about 1 to 12 for a new-born child, and from 1 to 10 to 1 to 6 in older infants. When given weaker, as is very frequently done, it may be a digestible food but it is very deficient in nourishing properties. In all cases where it is possible fresh cream should be added.

The *advantages* of condensed milk are, that it is easily procured and prepared, and that it is readily digested by babies, owing to its being neutral in reaction and



comparatively sterile, and to its containing a low percentage of casein.

The *disadvantages* mainly depend on its defective composition. It is not sufficiently nourishing, and, practically, we find that in the great majority of cases, although children readily grow fat on it, they are apt to be pale and languid, if they get nothing else, and to go down very quickly when they take any acute disease. They are very apt to suffer from rickets and they may also take scurvy.

Uses of Condensed Milk.—Under certain circumstances, condensed milk may be useful temporarily. For example, during the early weeks of life, if the child cannot digest cows' milk simply prepared, and the mother has not the time or intelligence for preparing it more elaborately, condensed milk (with the addition of cream if possible), may do well. Again, when anything goes wrong with the supply of cows' milk, or on voyages when fresh milk cannot be got, it may be invaluable.

Condensed milk, however, should never be used longer than is necessary; and if a child has ever, for any reason, to be put on it, it is always advisable to try him again, from time to time, with fresh cows' milk.

PROPRIETARY INFANTS' FOODS.

There are a large number of so-called "Infants' Foods" in the market, and it is important to know something of the composition of those most in use. The manufacturers generally claim that they are "perfect substitutes for the mother's milk," but one need only glance at their analyses to see that this is not so.

The following table gives the analyses by Professor Leeds of some of the most used of these foods :—

	Robinson's Patent Barley.	Ridge's Food.	Mellin's Food.	Savory & Moore's Food.	Nestlé's Food.	Horlick's Malted Milk.
Albuminoids .	5·13	9·24	10·07	9·63	11·00	15·83
Fats . .	0·97	0·63	0·18	0·40	4·25	5·30
Starch . .	77·76	77·96	...	36·36	36·86	5·57
Soluble Carbo-hydrates .	4·11	5·19	68·18	44·83	40·91	66·99
Ash . .	1·93	0·60	3·75	0·89	1·70	3·13
Gum, Cellulose, &c. . .	1·33	...	5·45	0·44	0·28	...
Water . .	10·10	9·23	12·37	8·34	5·00	2·18

The foods which are most commonly used here may be divided into three classes.

1. **Farinaceous Foods.**—Such as Ridge's & Neaves' Foods, which are similar to one another in composition, and Robinson's Patent Barley. These differ but little from ordinary wheat or barley flour and therefore consist largely of unaltered starch.

2. **Malted Foods.**—Examples of these are Mellin's and Horlick's Foods, which are made from flour which has been acted on by malt until all the starch in it has been changed into soluble carbo-hydrates. In Savory & Moore's and Allen & Hanbury's No. 3 Foods, only part of the starch has been thus converted.

3. **Milk Foods.**—These are made with condensed milk



to which some form of cereal has been added. Thus Allen & Hanbury's No. 2 Food contains, in addition to the condensed milk, maltose, dextrin and soluble phosphates prepared from wheat meal. Nestlé's Food contains a large proportion of unchanged starch along with condensed milk; while in Benger's & Carnrick's Foods, and in Horlick's Malted Milk, the cereal element is malted and the milk to some extent peptonised, either before or during the process of preparation.

All these foods, it will be observed, differ essentially from human milk in many ways, for example in the very small percentage of fat which they contain. Many of them also differ in the fact that they consist largely of unaltered starch, a material of which, as we have already seen (p. 7), the young infant can digest only a very small quantity.

It is obvious, therefore, that they are quite unsuitable as substitutes for the mother's milk and, when used in this way, are almost certain to do harm. Sometimes, however, they are useful for older children because they provide a palatable and digestible form of carbo-hydrate food; and the malted preparations are occasionally beneficial on account of their laxative properties. When farinaceous food is to be given to infants, it is generally better to use some good form of wheaten, barley, or oat flour rather than one of the proprietary articles, and it can be malted if required by the use of an infusion of crushed malt such as Sir Wm. Roberts recommends[1] (Appendix D).

[1] *Collected Contributions on Digestion and Diet.* London, 1891, p. 224.

FOOD, OTHER THAN MILK, SUITABLE DURING THE FIRST YEAR.

When the baby is about seven months old, his first teeth usually make their appearance; and, when several of these are through the gum, this is generally taken as a natural indication that its digestion is beginning to be fit for more complicated food. The child also often shows signs of being less satisfied than he used to be with his usual diet. It may now be advisable to give some form of *starchy food.* If, however, the child is growing satisfactorily, and is quite contented, it is just as well to go on with milk alone for another month or two, especially if the teeth are late of coming. When, however, in a healthy child the teeth are very long of coming, this should not of itself be considered a sufficient reason for deferring the giving of starchy food. It is extremely important to explain to the mother that the starchy food has to be given *as an addition to* the milk and is not to take its place.

When the baby is nine or ten months old, he should have at least five meals a day (7.30, 10.30 A.M; 2, 5, and 10.30 P.M.). These should consist mainly of milk, still diluted a little, but to the first and fourth some suitable farinaceous food may be added. For this purpose oat flour does very well, or Chapman's Wheat Flour, and barley jelly or bread jelly (see Appendix D), or one of the proprietary foods, may be used.

It is also well about this time to add to the midday meal some additional nitrogenous food, such as beef tea or chicken tea, or the white, or preferably the yolk, of an egg



beaten up with the milk. The following analyses are of interest in this connection :—

ORDINARY BEEF-TEA. (CHEADLE.)		WHITE OF EGG. (KOENIG.)		YOLK OF EGG. (KOENIG.)	
Water . . .	96·31	Water	85·50	Water	51·03
Fat	0·00	Fat	0·25	Fat	31·39
Albuminoids .	0·82	Albuminoids .	12·87	Albuminoids .	16·12
Extractives .	2·09	Free Extractives	0·77	Free Extractives	0·48
Salts . . .	0·78	Salts	0·61	Salts	1·01

FOOD FROM TWELVE TO EIGHTEEN MONTHS.

The midday meal may now be increased; and, in addition to what has been already mentioned, the child may have such things as mashed potato, or rusk, or bread crumbs with gravy, a lightly boiled egg, custard pudding, or any plain farinaceous pudding. The other meals should remain as before.

FOOD FROM EIGHTEEN MONTHS TO TWO YEARS.

At this age, in strong children, four meals a day may be sufficient, as the baby will often do without his evening meal, and sleep right on till morning. A little fish, chicken, rabbit, or even butcher-meat, or a lightly boiled egg, may now be given for dinner. The meat must be minced and pounded, as little chewing can be expected of the child as yet. The amount of mashed potatoes and pudding is also to be increased, and stewed fruit and sieved vegetables given. Bread and butter may be allowed in moderation.

Alcohol, tea, coffee and condiments of all kinds, should, of course, never be included in a young child's dietary; and pastry and cheese are also very unsuitable. Such articles are frequently the cause of serious illness in delicate children.

It is very important that, during the second year, *the amount of milk should not be much diminished* (1½ to 2 pints). Farinaceous and other solid food is to be given in addition to the milk, but it is not to replace it, to any great extent. Neglect of this rule is the cause of much weakness and illness among children.

If the child is thirsty between meals there is no harm in allowing him a drink of water, and if a meal is delayed he should have a glass of milk or a plain biscuit. Under ordinary circumstances, however, the frequent eating of biscuits and sweets between meals is altogether inadvisable.

THE DIET OF OLDER CHILDREN.

With regard to the feeding of older children there are a few points which require mentioning. Growing children must of course have plenty of suitable food, and big boys may require quite as much to eat as adults do. It is important, however, not only that children's food should be sufficient in amount, but also that it should be given at proper intervals and under proper conditions otherwise. Children should not have to wait too long for their meals, especially if they are young, or they will get faint and irritable, and when the food does come they will eat it too hurriedly and take too much of it.

Eating between meals also, with the exception of a light and suitable lunch, should always be discouraged. A taste



for milk should be encouraged in every possible way. A strong aversion to it is manifested by some children, and this may be very difficult to overcome, but it should not be readily acquiesced in. In the case of a severe illness, the child who will take milk freely has generally a much better chance of recovery than one who refuses to do so.

Farinaceous foods form a very important element in the child's diet. Oatmeal porridge suits most children and, for those who cannot take it, its place as a wholesome and nourishing breakfast dish is very difficult to fill with other things. Some children cannot take it without suffering afterwards from unpleasant symptoms of dyspepsia. When this is so, it may have to be given up, but before doing so it is well to try whether more prolonged boiling may not make it sufficiently digestible. Sometimes barley-meal or wheat-meal porridge will agree where oatmeal cannot be tolerated. Cornflour, arrowroot, sago, rice and other similar substances are excellent additions to a child's diet, provided that it also comprises plenty of nitrogenous and fatty foods.

Sugar in its various forms is another important food for children, and it is to be regarded as such and not merely as a means of gratifying the childish taste for sweet things. Sweets should always be given either with food or just after meals. When given at odd times between meals they often do harm to the digestion as well as to the temper. If a child has a poor appetite and a furred tongue, sweets of all kinds should be strictly forbidden.

Animal food is best given to young children in the form of eggs, fish and white meat. Butcher-meat should be used sparingly. This is especially important in those who are nervous or come of gouty families. Children who are

having more meat than they can properly digest are usually slender and pale faced and have a furred tongue, a bad breath, and other signs of indigestion. They often sleep badly, are drowsy in the mornings and apt to be languid and irritable.

Such things as salt beef and salted or smoked fish are bad for young children; and fried foods, with the exception of bacon fat and lightly fried white fish, should generally speaking be avoided. The fat of meat is good for children and they should, on all accounts, be taught to eat plenty of it. Butter is also good for them and should be given liberally.

Fruit, if fresh and ripe, is very wholesome, and so to a less degree is jam, but the latter should not be allowed to take the place of butter. Fresh vegetables are also useful, and a taste for them should be cultivated.

Tea and coffee are bad for young children, and indeed most town children are better not to have them regularly before they are ten or twelve years old. Cocoa is much more suitable and forms a nourishing and popular beverage which may be given with advantage even to children of four or five years. Pickles and all sorts of highly seasoned foods are, of course, never to be given to children.



CHAPTER XIII.

ON NURSERY HYGIENE.[1]

CLOTHING.

THE details—even the minute details—of a child's clothing are well worthy of attention. We will refer briefly to the main principles which should guide us.

General principles.—A child's clothing should be uniformly warm, soft and light. It should also be moderately loose, so that it does not exert undue pressure on any part of the body and can be quickly put off and on.

The clothes must be sufficiently **warm**, not only because this is necessary in order to prevent chills, but because if the body is not adequately protected, it has to waste more nerve energy in heat production than it can fairly afford. Children's heat-producing powers are feebler than those of adults, sufficient clothing is therefore especially important for them. Any attempt at hardening a child, as it is called, by under-clothing him, is to be regarded as even more foolish than over-heating him by too many or too thick clothes.

It is also extremely important that the protection from

[1] On the subject of this chapter the reader will find much useful information in *Hygiene of the Nursery*, by Louis Starr, M.D., Fourth Edit., London, 1895; and in *Hygiene of Childhood*, by Francis H. Rankin, M.D., London, 1890.

cold provided by the clothing should be uniform. Many recurrent catarrhs of the respiratory and digestive tracts are due to bare arms and legs and scantily covered bellies. Long sleeves and stockings and a knitted or flannel binder are very effective in warding off such attacks.

Paralysed limbs especially should be well covered, both in the day time and at night. Warmth favours the circulation in them and lessens the often inevitable atrophy. Should ordinary thick or double stockings or sleeves not be sufficient, it is well to have them padded with cotton wool.

The baby's clothes should be **soft, light,** and **loose,** because his skin is soft and tender and easily chafed, and his movements are so feeble as to be readily hampered by slight restraint. Constriction of any part of the body or limbs is prejudicial to normal growth and development, and is therefore to be avoided.

Lastly, little children ought to have their dress so arranged that it can be **put on and off** as **quickly** as possible. This is more important in the case of feeble and sick infants, who may suffer seriously if they are wearied and irritated, and chilled by an unnecessarily complicated process of dressing and undressing. In all serious illnesses, it is advisable to discard ordinary clothes with their numerous buttons, and tapes, and bands, and to substitute for them simple flannel night-clothes lined with thick layers of cotton wool or some similar substance.

When we come to apply these elementary principles, we find that woollen garments of loose texture (*e.g.* knitted ones) are the best for a child to wear, especially next the skin. Wool is a bad conductor of heat, but is easily permeable, so that it does not interfere with the free



evaporation of moisture from the skin. The only exception to this is in the case of the napkins which babies have to wear until they gain some measure of control over the bladder. These are generally made of linen or cotton, because they have to be frequently washed. Occasionally we find a mackintosh worn over the napkin to save trouble. This is objectionable, as it is sure to cause irritation of the skin. When soda is used instead of soap in washing the napkins, there is also a risk of skin irritation.

The child's bedclothes should not be so thick and heavy as to overheat him, but they require to be a little warmer than those he wears during the day, to make up for the want of exercise while sleeping.

FRESH AIR AND SUNSHINE.

For children, fresh pure air, cleanliness and warmth are absolutely necessary for perfect health, and sunshine is especially important. Children, like flowers, get pale and droop without the sun. The nursery should therefore, if possible, be the sunniest, driest, freshest room in the house. It should have a southern exposure, be well ventilated and kept at a temperature of 60° to 65° F. In the badly ventilated rooms of the poor, the windows should be opened several times during the day, with due precautions against draughts. The children of many of the respectable poor are less robust than those of their more careless neighbours, because of the care with which they are protected from cold and at the same time from fresh air.

Draughts.—While seeing carefully to the ventilation,

however, we must, in many forms of illness, be careful to avoid draughts. For healthy children the risk of injury from draughts is generally much less than that from deficient ventilation; but for those who are liable to recurrent bronchitis or rheumatism, the danger is a real and important one. It is well to remember that large plate glass windows cause a constant draught in their immediate vicinity.

Going out.—As a general rule a baby should be taken out every fine day, summer and winter. If he is born in summer he may be taken out for the first time about a fortnight after birth. If in winter, not for a month or six weeks—and then only if the weather is very fine. At first he should not be out longer than from fifteen to twenty minutes, but later, if the weather is warm and dry, he can scarcely be too much in the open air. It is important not to allow young or delicate children to be taken out in windy weather, even although the thermometer is not very low, because they are readily chilled by wind. In the same way it is important that babies should be carefully protected from the sun in warm weather. The evaporation which takes place from wet roads is sometimes a source of chill in the case of delicate children who are old enough to walk, even although the weather overhead is not very cold.

Little children should not be taken out, even in good weather, if they are coughing and sneezing or otherwise suffering from the results of a recent chill. When, however, children who are past baby-hood are well, it is safest in the long run to err, if at all, in sending them out too much or in too cold weather rather than in keeping them too much shut up.



WASHING AND BATHING.

A baby should have one bath every day and if he is strong he may have two. Harm is certainly often done by too much bathing of delicate children. For babies who are not strong, one regular bath, and sponging in place of a second, is much better than two baths.

The temperature of the bath should be about 90° F. in the case of young babies; and, if they are delicate, it is always well to use a bath thermometer. The water should never be warmer than 95° F. As the baby grows older the bath, especially in warm weather, may be reduced to 85° or even 80°.

Very little soap is required for the general surface of the body in a young infant, and soaps containing much free alkali are especially to be avoided. For children with delicate skins, some form of overfatty soap is desirable; but, for ordinary healthy children, plain unscented soap does perfectly well.

The bath should be given in a part of the room where there is no draught, and the baby should never be in it more than five minutes. The drying process after it must be rapid and thorough. It is customary after drying the baby to apply some soothing powder to those parts where folds of skin are in apposition. For this, oxide of zinc and starch and boracic powder (F. 10) or plain fuller's earth may be used. Should there be any tendency to intertrigo some simple ointment such as zinc ointment, cold cream or vaseline is better.

If a baby's skin and nails turn blue and his nose and limbs get very cold after the bath, and it seems to weaken

and depress him, it may be necessary to stop the bath and only to have him sponged instead, as much as is necessary for cleanliness.

The Cold Douche.—Ordinary cold douches are very good for many older children, but for the little ones in the nursery, and those who are delicate among the older children, they should only be given in modified forms and always with caution and attention to details.

The best way to give a cold douche to little children is, after they have been washed in warm water and are still sitting in it, to pour some cold water from a big sponge or from a jug over their shoulders and to take them out immediately and dry them thoroughly.

When a cold douche is to be given to a delicate child he should always, while he is having it, stand in a little hot water. When this precaution is taken, the bath will often do good when otherwise it would not have done so. Care should also be taken that the room is warm and that the child is not allowed to chill himself before the bath begins by hanging about or playing without sufficient clothes on. Disregard of precautions in such matters often results in recurrent ailments which are attributed to special delicacy. It is a good plan to have the child shampooed thoroughly all over, for five or ten minutes before the bath, and energetic friction with a rough towel in drying, after it, is stimulating and beneficial.

Uses of the Cold Douche. — Cold douching carefully carried out is extremely useful for many children. It stimulates the nervous system, improves the circulation, and often does away with the coldness of the feet which is such a troublesome symptom. The appetite also increases



under its use and the children become altogether healthier and happier, and are less liable to take cold.

Modification of Cold Douche.—Sometimes the cold douche disagrees with the child and causes unpleasant symptoms. For example, instead of its leaving him with a healthy glow and an increased appetite and generally brightened up, he may be pale and shivery after it, with cold blue fingers and a disinclination for food ; or the healthy reaction may only last a short time and be followed by weariness, headache and a feeling of chilliness.

If a cold bath, given with all due care and precaution, results in either of these conditions, it must be modified or discontinued. Often a tepid salt water bath does very well in such cases, the salt increasing the stimulating effect of the water on the skin. Again, in children with a weak circulation, thorough rubbing of the body, with a coarse towel which has been wrung out of cold water, is sometimes an excellent substitute for a regular bath.

In other cases, the cold bathing may be limited to certain parts. Children with cold feet who cannot stand an ordinary douche may be benefited by having their feet bathed in cold water and afterwards briskly rubbed ; and a similar cold sponging of the throat and shoulders is useful for diminishing the liability which some children have to take throat colds. Lastly, many children who cannot stand cold bathing in winter may benefit from it greatly in summer.

Hot Baths.—While cold baths may do harm sometimes, hot baths are just as likely to do so if injudiciously given. They must not be given too hot or too often (once in the week is enough), and the child should not be too long in

them—never more than ten minutes at longest. The effect of such a hot bath is stimulating, but a long continued one is weakening and relaxing. It is very important that the child should not catch cold after the bath, hence it is better to give it just before he goes to bed.

Sea-water Baths.—Sea-water baths are good for children of all ages, but a child should not be allowed to bathe in the sea until he is six or eight years old, or oftener than once a day. The best time for a sea bath is three hours after a meal, but the child may go before breakfast, provided he has a biscuit and milk before starting. The bath should never be taken immediately after a meal; and never when the child is feeling chilly or is hot and perspiring. The head should be wetted first, and the child should not, even in hot weather, be allowed to stay in longer than fifteen or twenty minutes. After the bath he should be rapidly dried and dressed, and should have a sharp walk and a biscuit or a glass of milk.

Sea-bathing should make a child hungrier and in better spirits. If, however, he gets dull and chilly and seems out of sorts while he is having it, this indicates that it is not agreeing with him and that it should be stopped.

Hair.—The hair should, of course, be kept very clean; but much washing, especially with soap, certainly causes dryness. In little boys with short hair, the head should be washed every day; but in older children with long hair, once a week is enough. If, with an ordinary amount of washing, the hair gets very dry, it may be necessary to use a small amount of oily matter of some kind to replace the natural grease which washing has removed; but, as a



general rule, it is better in every way to put no pomade of any kind on the hair.

If scurf gathers on the scalp it should be removed by washing with soap and water, and not by means of a comb as this is apt to injure the roots of the hair. For the same reason, the brushes used for children's hair should be soft, and the teeth of the comb should be blunt and not too close together.

CHAPTER XIV.

ON THERAPEUTICS.

BATHS AND OTHER EXTERNAL APPLICATIONS FOR THERAPEUTIC PURPOSES.

Cold or Tepid Sponging.—Cold sponging is very useful for reducing temperature, and should generally be tried before having recourse to stronger measures. Its effect is increased if spirits of wine, Eau de Cologne or vinegar is added to the water. The water may be used at 80° F. and the process should last five or ten minutes. Care must be taken that the child is not unnecessarily exposed nor his bed wetted.

Wet Packs.—The ordinary wet pack is also of value, being easily applied and more efficacious in reducing temperature than simple cold sponging. A small sheet or large towel wrung out of cold water is rapidly folded round the child and he is then wrapped up in a blanket. The pack may be repeated in twenty minutes unless the child is sleeping, in which case he may be left in it for an hour or more. This is useful in all general feverish conditions.

Local wet packs or wet compresses are useful in many illnesses. The application of a wet stocking round the neck is an excellent domestic remedy for a simple sore throat; and a wet compress around the abdomen at night is soothing and efficacious in some forms of indigestion with discomfort.



The Brandy Pack.—In cases of ptomaine poisoning, with or without vomiting or diarrhœa, when the skin is inelastic and the urine scanty, Dr Eustace Smith[1] recommends that a large towel, wrung out of cold water containing a sixth part of brandy or Eau de Cologne, should be wrapped round the child's body and that he should be left covered with several blankets for three hours. The pack is renewed at the end of this time, and the child may sometimes be kept in such packs for twenty-four hours with advantage.

The Mustard Pack.—This is a useful form of external stimulant for cases of collapse or prostration. It causes less disturbance to the patient than the mustard bath. A tablespoonful of mustard is mixed with a quart of tepid water, and a towel is dipped in this and swathed round the whole body. The pack may be continued for ten or fifteen minutes, at the end of which time the body will be distinctly red. Similar applications to the chest are often useful in cases of bronchitis and collapse. During the intervals between their application, a cotton wool jacket should be worn.

The Cold Douche.—The best method of applying the cold douche, and its stimulant value, for delicate as well as for strong children, have been already discussed (p. 224). We shall afterwards refer to the great benefit to be derived from it in cases of rickets with laryngismus or other neuroses.

The Cold or Tepid Bath.—A cold bath is very useful for reducing temperature in children, and their small size makes it easy of application. The patient should be put

[1] "The Diet and Therapeutics of Children," *Clifford Allbutt's System of Medicine*, Vol. i., p. 419.

into water at about 100° F., and it has then to be gradually cooled to about 80°, or even 75°, by adding cold water or ice. The child may be kept in the bath from five to fifteen minutes, and the state of the temperature and pulse must be closely watched all the time.

The Warm Bath.—The warm bath (90° F.) is used as a soothing application in cases of convulsions and laryngeal spasm. It is also useful as a diaphoretic, and is often given in the early stage of measles and other eruptive fevers to encourage the rash to come out more fully. The child may be kept in it from ten to twenty minutes.

The Hot Bath.—A hot bath (100° F.) is of great value as a stimulant, especially in children exhausted by severe diarrhœa and vomiting, and in those with pulmonary collapse. The child must not, however, be allowed to remain too long in the water or he will be depressed. For an infant, three minutes is long enough, and for an older child about five minutes. The child should be rapidly dried after the bath and put between blankets, with a hot bottle to his feet.

The Mustard Bath.—The addition of mustard to the hot bath makes it more stimulating and effectual. The proper proportion of mustard is 1 oz. to each gallon of hot water. The mustard is made into a paste with a little cold water, and then gradually stirred into the bath or put into it in a muslin bag. The child is held in the bath till the arms of the person holding him begin to tingle. This is a very useful remedy in cases of prostration and collapse of any kind—especially in young infants.

Ice-bags.—These require to be used with great care in children, owing to the danger of depressing them too much.



They are frequently used in acute head cases, and Dr D. B. Lees strongly recommends their use in cases of pneumonia also.

Hot Fomentations.—These are made with flannel or spongio-piline, and are generally most used in chest cases. They are cleaner than poultices and require less skill for their proper application.

Poultices.—Poultices are not so much used now as they formerly were. This is partly because it is so difficult to get them properly made and applied; and their place is largely taken by hot fomentations. In many cases, however, where a child is suffering from uneasiness in the abdomen from any cause, a large poultice is very soothing and may secure a measure of relief which it would be difficult to obtain in any other way. Poultices are also very useful when there is pleuritic pain.

Mustard Poultices.—Mustard poultices are very valuable. For young babies, they should be made with one part of mustard to five of linseed meal. The mustard and linseed are mixed together dry in a bowl, hot (not boiling) water is then added, and the poultice is made, and applied on a handkerchief. It may be left on for six or eight hours, and should be followed by a thick layer of cotton wool. For older children, the proportions may be one to three or four, but the poultice should not be left on longer than four hours.

Pure mustard must never be applied to an infant's skin, as it is apt to produce serious sloughing. In older children, a small mustard plaster or a piece of mustard leaf the size of a penny may often be applied to the episternal notch with great effect in cases of irritating

throat coughs, such as are met with during the eruptive stage of measles.

Blisters.—In young infants blisters should never be applied, and in older children they must only be used with great care on account of their tendency to cause sloughing. It is generally best, to begin with, to leave the blister on for one or two hours only, and if it has not risen then, to apply a poultice over the place. Blisters are not often used in childhood, but they are sometimes useful in pericarditis with effusion, and in some cerebral cases where there is fluid in the ventricles.

Depletion.—Blood-letting in any form is practised much less in children than in adults; but it is very useful in cases where from acute pulmonary, or other disease, the right side of the heart has become rapidly over-distended and syncope threatens. Under these circumstances, the application of four to six leeches over the sternum may turn the scale in favour of recovery. The application of leeches is also of value in some cases of acute meningitis and otitis in strong children.

MEDICINAL TREATMENT.

Dosage.—It must be acknowledged that Gaubius' table and other posological tables are sometimes useful to the beginner in helping him to prescribe suitable doses for children. Their usefulness, however, is very limited. The age of the child is not the only criterion to be taken into account in deciding the proper dose. His condition as to size, weight, and strength is often quite as important. We have also to remember that while some drugs, such as opium, have to be given with special caution, others, like digitalis



and quinine, are well borne, and one or two, such as belladonna and arsenic, can usually be taken in larger doses by children of five to ten years than by adults.

It is particularly important in dealing with children to have fluid medicines measured, if possible, in a measure-glass rather than in a teaspoon or by drops. If this is not possible, we must inspect the teaspoons which are to be used and try the bottles which are to be dropped from. The teaspoons in ordinary use differ considerably in size, and many of them contain 90 instead of 60 minims. The size of drops also varies greatly not only with the nature of the fluid measured but also with the shape of the bottle from which they are dropped.

The form of the dose is of more importance in children than in older patients. The medicine should of course be made as palatable as possible, and a large dose should not be ordered if a small one will do as well. Obstinate refusal of medicine is more likely to be met with in children with slight ailments than in those who are seriously ill. When, however, this occurs in grave illness, it becomes a matter for serious consideration whether the consequent struggle may not do more harm than the medicine does good.

A few remarks may be made about some of the drugs which are most useful in the treatment of children.

Alcohol.—Stimulants should never, of course, form part of a healthy child's diet, but, in debility, great benefit sometimes results from small doses of wine or beer or brandy and egg mixture, taken with food. Alcohol is also frequently of great use in acute disease, in childhood as in later life. In ordinary feverish illnesses, stimulants are not required; but, if there are signs of heart failure or if a

typhoid condition should set in, they are urgently called for. Alcohol is also useful in various exhausting conditions, such as the pulmonary and other complications of whooping-cough or measles, and in septicæmia. It is often valuable in children with atrophy, and especially in those who have been greatly reduced by diarrhœa and vomiting.

Alcohol may be administered in the form of brandy, whisky, wine, or sherry whey. For dispensary patients in general it is best to order whisky, as it is more easily obtained of good quality than the other forms of stimulant. If it is desirable to give small doses of alcohol to an infant whose surroundings are such as to render it inadvisable to order plain whisky, a few drops of rectified spirit or brandy may be added to each dose of any medicine that he is taking. When whisky is ordered for young babies it must not be given too concentrated—not more than fifteen drops to the teaspoonful. In ordering stimulants it is always well to indicate the minimum to be given in the twenty-four hours, and also the amount that is not to be exceeded. A baby of a year old may have from two drachms to half an ounce of whisky or brandy in the twenty-four hours, and this may be increased in some cases to one or even one and a half ounces. To a child of three or four, double this amount may be given. Small doses frequently repeated and well diluted are preferable to larger doses given at longer intervals. If the amount of the stimulant is not strictly prescribed the patient will be liable to get either too little or too much. I have seen several children whose parents were distressed on account of their torpor and inability to recognise their family, and in whom those



symptoms were solely due to their having had too much alcohol.

Tonics.—Tonics are often of great value, and their use will often speedily bring a child who has been ailing back to his normal condition. In some instances, however, their application is much restricted owing to the child's digestion being easily upset by them, and the improvement, if any, is therefore only partial or temporary. When this is so, a change to the country, especially to hill air or to the sea-side, will often have an immediate and lasting good effect.

Cod Liver Oil.—Perhaps the best and most generally useful of all tonics for young children is cod liver oil, but it must be given in moderation and with discretion or it is apt to disagree. It should not be ordered if there are signs of indigestion; and, if its administration interferes with the child's appetite or digestion, it must be discontinued for a short time, and an alkaline or acid tonic substituted. This will often improve the digestion, after a week or two, so much, that the child will be able to take the oil again with benefit. Those who can take cod liver oil well, in winter, are often unable to digest it during hot weather. It is of great value in all cases of rickets, anæmia and debility, in which the digestion is sufficiently strong to be able to stand it.

From 10 to 30 minims thrice daily is a sufficient dose for most young children, and it may either be given pure or in the form of an emulsion (F. 11 and 12). If it agrees well the dose may be increased to a teaspoonful, but if undigested oil is noticed in the motions the dose must be diminished.

When cod liver oil cannot be taken by the mouth, owing to the state of the digestion, it may be used in the form of

inunction. For this purpose, however, any simple animal fat or oil does as well as cod liver oil, and several, such as neat's foot oil and benzoated lard, are preferable because they have not such an unpleasant smell. Cocoa butter seems to be equally efficacious. The child should have a warm bath, the oil should then be warmed and carefully rubbed into the skin all over the body with a soft sponge or piece of flannel, and he should be put to bed with a flannel nightdress on.

Iron.—The majority of pale, feeble-looking children are not benefited by the use of iron, and many of them are made worse by it. Their pallor is secondary to existing dyspepsia and, as the iron increases this, it does no good. Delicate children, who have been taking Parrish's syrup, or some other chalybeate preparation, for months without improvement, will often at once gain in appetite, colour and brightness if that is changed for an ordinary alkaline and bitter tonic (F. 14). In some cases of anæmia and dyspepsia, however, the indigestion is secondary to the anæmia. In these, and in cases of anæmia where the digestion is not much impaired, iron is of the greatest service.

A convenient form for administration to infants is reduced iron (gr. ½ to 1 thrice daily after food). In older children some form of iron wine may be used or, if there is constipation, the sulphate along with a laxative (F. 13). The compound syrup of the phosphate of iron is easily taken by children; as, however, the syrup in it may cause acidity, it is often better to give a preparation in which glycerine is substituted for the syrup.

Arsenic.—In some forms of anæmia, arsenic is very useful and children often bear it well. It is of great value in



the treatment of certain kinds of dyspepsia, especially where there is colicky pain after food, as well as in lienteric diarrhœa. For such cases one drop of Fowler's Solution (or in infants half a drop) should be given, well diluted, immediately before food thrice daily.

For chorea, arsenic is best given in large and increasing doses. A child of five or six may begin with five drops of Fowler's Solution, thrice daily after food, and increase the quantity by one drop every two days until symptoms of poisoning appear. These are a general flushing of the skin, redness and itching of the eyelids, a white fur on the tongue, vomiting, diarrhœa and sometimes a rise of temperature with albuminuria. When the medicine is discontinued these symptoms rapidly pass off.

Quinine.—Quinine is one of the drugs which children bear well and can take in comparatively large doses. Its taste, however, constitutes a great difficulty, and prevents its being ordered as frequently as it otherwise would be. It is given in septic cases, in malaria and in some other forms of pyrexia. It is valuable in whooping-cough but has to be given in large doses (3 to 4 grs. for a child of eighteen months) (Leech). It is sometimes most successful in chronic urticaria, in young children, a dose (1½ grs. for each year of the child's age) being given at bedtime (E. Smith).

The mode of its administration will always be a troublesome question. It is usually given in simple solution, one grain of the sulphate to a teaspoonful, and some flavouring or sweetening substance (such as syrup of orange-peel, 20 minims to a ½ grain) may be added, though none of them are quite successful in disguising the taste. In children

over three, the sulphate may be given in the form of capsules or it may be made up into very small pilules which can be mixed with jelly and thus swallowed (West). The tannate may also be given in powder or with chocolate. It is comparatively tasteless, but has to be given in three times the quantity of the sulphate, and is said not to be so reliable in its action. If quinine cannot be given by the mouth, it may be administered in the form of suppositories or as an enema—double the ordinary dose being used. It may also be given hypodermically, but this can rarely be warranted except in severe cases of malaria.

Strychnine.—Solution of strychnine and tincture of nux vomica are useful tonics, and are usually taken quite well if sufficiently diluted. Of the former, one-third to one minim thrice daily may be given to children of one to five years old, and two minims to older children. Of the latter, double these doses may be employed.

In cases of extreme collapse from infantile diarrhœa, Dr Eustace Smith [1] recommends the hypodermic injection of $\frac{1}{4}$ minim of solution of strychnine to be repeated in three-quarters of an hour.

Digitalis and Strophanthus.—These are well borne even by young children.

Mineral Acids.—The dilute acids are often of benefit in certain states of the digestion. They are also useful in diarrhœa, on account of their anti-fermentative action. One or two minims of dilute hydrochloric, nitric, nitro-muriatic, or sulphuric acid may be given, in each dose, to infants of from six to twelve months, and from two to four

[1] Art. "Diarrhœa of Children," *Allbutt's System of Medicine*, Vol. iii. p. 766.



minims to children of from five to ten years. It is well to dilute the acid to the extent of a tea-spoonful to each minim, otherwise there may be difficulty in getting a child to take the medicine on account of its taste.

Alkalies.—There are few medicines which are so often successful in temporarily improving the condition of weakly children as alkaline tonics consisting of bi-carbonate of soda and any bitter infusion with or without the addition of nux vomica (F. 14). Alkalies are also of great use in the treatment of many nervous and other ailments arising from an acid fermentation of food in the alimentary canal.

In feverish conditions, a mild alkaline mixture containing liquor ammoniæ acetatis, or citrate of potash is indicated; and in urinary disorders with acid urine, large doses of the citrate (12 to 24 grs. in the day for an infant) may be required to keep the urine alkaline.

Mercury.—Grey powder, calomel, and solution of the perchloride of mercury are much used in childhood, not only in the treatment of syphilis but also in various dyspeptic disorders on account of their anti-fermentative action. Full doses of mercury by the mouth, or by inunction, are also useful in some other forms of disease, as in non-tubercular meningitis. Calomel is a useful purgative in many conditions. In cases of acute tonsillitis and commencing laryngeal catarrh, the treatment should generally begin with a mercurial purge. One grain of calomel may be given to a child under twelve months; two grains to one of two years, and three grains to those between three and seven years old; or one-sixth of a grain may be given every hour until the bowels act.

For congenital syphilis in infancy, gr. ½ to 1 of grey

powder may be given thrice daily according to the severity of the symptoms, and this may be increased to 2 grs. each dose. Solution of the perchloride of mercury may be given in doses of 20 to 30 minims. Should digestive derangements arise, bismuth and soda may be added to the grey powder, or it may be discontinued and inunction employed. For this, blue ointment is used either pure or diluted with lard in doses of 10 to 20 grs. in the day. It may be rubbed into the palms and soles, or into the sides of the chest, abdomen, and thighs, and it is usually advisable also to apply some of it on a flannel binder worn round the belly, so that the child's movements may favour its further absorption.

Weak mercurial ointments (*e.g.* nitrate or ammonio-chloride of mercury grs. viii to ʒi) are very useful in the treatment of impetiginous eczema and of most forms of sore in strumous children.

Opium.—Opium is a valuable remedy in childhood; but it must be used with care and its effects watched, especially in infants, as they are very susceptible to its action. To premature babies, and those who are suffering from severe or acute respiratory disease, it should never be given.

It is chiefly of use in relieving pain and in quieting the action of the bowels. It forms a useful addition to diarrhœa mixtures, not only on account of its effect on the peristaltic action, but also because, by diminishing the rapidity with which the other ingredients pass through the bowel, it gives them time to act. It may also under certain circumstances be useful in allaying spasm, as in whooping-cough and croup, and in soothing irritable coughs, but it should never be used for ordinary restlessness or to procure sleep.



The dose must be regulated by the size and strength of the child as well as by his age—a wasted baby of a year old requiring a smaller dose than a big strong child of six months. Some children are specially intolerant and some more than usually tolerant of the drug. Cases of extreme susceptibility to opium in strong children are very rare indeed and, if reasonable precautions are taken, no danger of poisoning need be feared. The effect of the first dose should always, however, be watched; and, if the child is not to be seen again for sometime, it is well to instruct the mother not to repeat the medicine if he is drowsy, and to stop it whenever the symptoms for which it is being given are relieved.

Laudanum, nepenthe, and solution of hydrochlorate of morphine may be taken safely by children a year old in doses of $\frac{1}{2}$ to 1 minim, while, to those of six months, $\frac{1}{6}$ to $\frac{1}{3}$ of a minim, and, to those of two months, $\frac{1}{20}$ of a minim may be given. A child of twelve months may have a $\frac{1}{2}$ to 1 grain of Dover's powder.

Compound tincture of camphor is a convenient form in which to give small doses of an opiate to children. To infants during the first year one drop for each month of their age, and to a child of five years half a drachm may be given.

Codeine is sometimes helpful in cases of abdominal pain and tenesmus, and for coughs. For a child of a year old, $\frac{1}{20}$ of a grain is a suitable dose and, from $\frac{1}{12}$ to $\frac{1}{6}$ of a grain, for one of four or five years. Morphine may be given hypodermically, in doses of $\frac{1}{30}$ to $\frac{1}{24}$ of a grain, to a strong infant of a year old.

Chloral Hydrate.—Chloral is well borne by children. It

[illegible] especially useful in cases of infantile convulsions (p. 136) and in those which complicate whooping-cough. In young infants, 1 grain per rectum; 1 grain for a child of a month; 3 grains for one of six months, and 10 grains for one of a year old. It may be given by the mouth to children of one or two years old in doses of 2½ to 5 grains, and to older children in doses of 5 to 10 grains.

Butyl Chloral Hydrate is often given successfully for whooping-cough and other kinds of spasmodic cough in doses of 1 grain for a child of twelve months (F. 15).

Bromides of Potash, Soda and Ammonia.—The bromides are more generally useful than chloral. They may be given for the irritability of teething, for sleeplessness, and for nervousness of any kind. When a nervous child has to undergo a slight operation, such as excision of the tonsils, without chloroform, it is sometimes advisable to give him a large dose of bromide. Although this will not diminish the pain of the operation, it will make the patient drowsy and lower his sensibilities so that he will suffer less from the fright of it than he would otherwise do.

Under ordinary circumstances, from 1 to 2 grains, every two or three hours, may be given to infants of a month or two old, while children of a year or more may have 3 to 5 grains repeated at similar intervals.

It is well to remember, when bromides are being given to a baby, that a serious looking pustular rash may appear. This condition is not very rare, and may occur after small as well as large doses, being due to an idiosyncrasy on the part of the child.

Antipyrin is an extremely useful drug in childhood and is applicable under a great variety of circumstances.



Although first introduced into practice as an antipyretic, and sometimes efficient in that capacity, its main value depends on its sedative action. To children who are atrophied or prostrate from acute disease it must be given with caution. Generally, however, it is well borne even by young infants.

It is often successful in cases of whooping-cough which are not complicated by much bronchitis, and it is recommended for chorea. For night terrors and restlessness it is very useful, and for laryngismus and spasmodic croup it is a more reliable sedative than the bromides. It is also useful in colic and in the pains accompanying dentition in young infants. In cases of high temperature from septicæmia and pneumonia, it relieves the restlessness even when it has little or no effect on the pyrexia. One grain every four hours may be given for each year of the child's age during the first three years. For night terrors, in a child of from five to ten years, a dose of from 5 to 10 grains may be given.

Phenacetin may be used in the same cases as antipyrin and is also well borne. It has the disadvantage of being insoluble, and the advantage of being tasteless.

Antifebrin has also similar properties, but it is more depressing than antipyrin or phenacetin, and has no advantage over them.

Belladonna is a drug which children bear remarkably well. The tincture may be given to babies of a year, in doses of 4 or 5 minims, and, for children of six or eight years, from 20 to 30 minims is a usual dose. It is useful in pulmonary collapse and whooping-cough, and especially in enuresis.

Emetics.—In acute indigestion, emetics are valuable in getting rid speedily of the contents of the stomach. In bronchitis also they are of great use in helping to clear out of the bronchi any secretion which may be blocking them, and which is not effectually removed by coughing.

The most effectual and safest emetic is powdered ipecacuanha, and it should be given in doses of 5 grains every ten minutes until vomiting occurs.

Ipecacuanha wine acts well when it is fresh, but should never be trusted to otherwise, as its emetic properties are greatly diminished by keeping. We may also give sulphate of copper ($\frac{1}{2}$ a grain every ten minutes) or alum (1 drachm in syrup at similar intervals). Apomorphia should not be used, as it is too depressing.

Purgatives.—Castor oil is generally regarded as the safest and most reliable of purgatives. Its taste, which is its chief disadvantage, may be disguised, to a considerable extent, if the dose is shaken up in a bottle with a wine-glassful of hot milk, sweetened and flavoured with a piece of cinnamon boiled in it. Another successful device is to give the child a mouthful of dry oatmeal immediately before he takes the oil.

Senna may be given in the form of the syrup of senna pods or as compound liquorice powder. These preparations are easily taken, but they are more apt to cause griping than castor oil. They must always be used fresh.

Compound jalap powder is much used and is not unpleasant to take. It is, however, unreliable in its action. Jalapin is more certain and may be given in doses of 2 to 5 grains to children of two years old and upward.



Rhubarb may be given to older children in cachets and for younger children the syrup is a convenient form.

Carlsbad salts (a teaspoonful) is a useful form of saline purge for children over four, and a tablespoonful of any of the aperient waters may be given with an equal quantity of hot water or hot milk.

Hypodermic Injections.—It is not very often that we are called upon to use a hypodermic syringe in treating young children, the pain of the prick rendering this method of medication inadvisable when the remedy can be given otherwise. Subcutaneous injections are, however, extremely useful in certain serious and acute conditions. For example, morphine may be injected in convulsions and cholera infantum, atropine in cases of opium poisoning, and ether and strychnine in certain collapsed conditions.

The injection of sterilised salt solution into the subcutaneous tissue is sometimes valuable in cases of collapse from severe diarrhœa.

The back and the abdominal wall are generally preferable to the limbs as situations for hypodermic injections.

Applications to the Throat.—Morbid conditions of the pharynx and tonsils are generally most satisfactorily treated by the application, with a large brush, of some bland application which will do no harm if it is swallowed. In some children a spray may be used, but in most the brush is more effectual. Gargling should not be ordered for children under seven years, and, if it is prescribed at all, care must be taken to make sure that the child understands how to do it.

Applications to the Nose and Naso-pharynx.—There

are various ways of applying alkaline and antiseptic lotions to the nasal cavities and through them to the naso-pharynx. The lotion may be sniffed up by the child from his own palm or may be gently poured into the nostrils from a spoon, the head being tilted back slightly. The best way, however, is to drop the liquid into the nose by means of an ordinary medicine dropper, while the child is lying down.

THE MECHANICAL TREATMENT OF THE STOMACH.

The mechanical treatment of the stomach has a wider application in young children than in adults. It may be considered under two heads: 1. Forced feeding or gavage; 2. Stomach washing or lavage. Both these measures are simple of application and of great value in suitable cases as a means of treatment.

1. FORCED FEEDING OR GAVAGE.

Methods and Apparatus.—There are a great many devices by the use of which fluid food or medicine can be introduced into the stomach of a child who is unable or unwilling to swallow. In some of these the nose is used as the way of access to the pharynx. In others the food is passed through the mouth.

(*a*) *Nasal Feeding.*—Three methods may be described. The first and the simplest of these consists in pouring a bland form of liquid nourishment into one nostril, through which it rapidly finds its way to the pharynx, and is inevitably swallowed. The child should be kept lying on his back and his head held steady. The food given must



of course be quite unirritating in character (*e.g.* milk). It is poured into the nose by means of a glass ear-syringe, over the nozzle of which a small piece of indiarubber tubing has been fitted; or a special spoon may be used, the sides of which are folded over near the point so as to form a kind of narrow spout. The process of feeding must take place slowly, and regular intervals must be allowed for swallowing.

The second method resembles the first in all respects, except that to the nozzle of the syringe is attached a soft rubber tube, long enough to be passed through the nasal cavity to the pharynx.

It is used when the fluid given is of such a nature that it would irritate the delicate mucous membrane of the nose. When the fluid is bland the first method is preferable, as the passage of the rubber tube is itself a cause of irritation.

The third method consists in the passage of a tube through the nose, pharynx and gullet into the stomach. For this a soft rubber catheter (No. 12 or 13—French) is suitable. It is thoroughly lubricated, and passed into the nostril with the patient lying on his back, or in older children while he is sitting up. When the end of the catheter reaches the pharynx, there is often retching and some resistance is felt. The patient's head should then be inclined slightly forward and the tube pushed gently on. As it gains the œsophagus, it generally ceases to irritate the pharynx, and soon the passage of gas and liquid from its upper end indicate that it has reached the stomach.

The catheter may pass into the larynx, but this does not often happen; its occurrence is announced by coughing

and dyspnœa. More frequently it passes into the mouth, and this is likely to happen if there is much coughing and retching while the end of the catheter is passing the pharynx. When the catheter has reached the stomach and the retching has stopped, the food is introduced into it by a funnel or syringe.

A convenient funnel for this purpose is formed by a medium-sized glass syringe, from which the piston has been removed. It fits into the catheter easily, and should any obstruction occur, the piston may be introduced to help to clear it away. When the catheter is being withdrawn, its end must be tightly compressed lest its contents get into the larynx in passing.

(*b*) *Forced Feeding by the Mouth.* 1. This is generally carried out by the passage of an œsophageal tube into the stomach. The apparatus required is the same as that used for stomach washing, *viz.* a soft rubber catheter, connected, by a small piece of glass tube and a foot and a half of rubber tube, with a vulcanite funnel large enough to hold from 3 to 6 ounces. The size of the catheter used varies with the age of the child from 14 to 18 (French) and it should be provided with one or two extra eyes.

The child is placed on his back, his head being held steady by an assistant. The left forefinger is then placed lightly on the tongue to depress it, while with the right hand the catheter is passed down the pharynx for 8 to 10 inches. The funnel is raised for a few minutes to allow the escape of gas, and the food is then poured into it and rapidly finds its way into the stomach. When the funnel empties, the tube is tightly compressed and rapidly but gently withdrawn. If the with-



drawal of the catheter is done slowly or clumsily, it is apt to excite vomiting.

In infants who have no teeth, or only one or two, no gag is required. In older children some sort of a gag is necessary, as there is danger of the tube being bitten, and in them the process is much more difficult and not so generally useful.

2. A simpler form of forced feeding, first recommended by Mr Scott Battams,[1] often proves of great value. For this all that is necessary is an ordinary glass syringe, to the nozzle of which four inches of rubber tube are attached. The child, who is refusing food or who for some reason is not wanted to suck, is laid on his back, the tube is passed towards the back of the mouth, and the liquid is gently injected. In older children, who clench their jaws, the tube may easily be passed backwards between the teeth and the cheek, and the liquid in this way reaches the pharynx readily.

Indications for Forced Feeding.—The indications for forced feeding in children are many and various, and the method chosen must depend on the requirements of the case in hand and the nature of the fluids to be administered.

1. In the rearing of premature infants, periodic feeding, either through the nose with a spoon, or by means of a catheter passed through the mouth, has been found of great use (Tarnier).

2. Similarly, in young infants and others who are so weak that the effort of sucking and swallowing exhausts them, great benefit may be got from forced feeding either through the nose or preferably by Mr Scott Battams' method.

3. In some cases of prostration (*e.g.* in enteric fever)

[1] *Lancet*, June 16 and 23, 1883.

there is obstinate refusal of all food and medicine to an extent which seriously endangers life. These cases may be effectually treated by one of the methods of nasal feeding or preferably by the syringe and short tube.

4. The same methods are very serviceable in cases where swallowing is interfered with by pain due to ulceration of the mouth or throat.

5. A few years ago Dr Kerley[1] drew attention to the fact that regular forced feeding by means of an œsophageal tube passed into the stomach was extremely useful in persistent vomiting in infants. Babies who are not able to retain a teaspoonful of fluid swallowed in the ordinary way will usually retain a much larger amount of nourishment if it is poured into the stomach through a catheter. The explanation of this remarkable fact is obscure but of the value of its application in practice there can be no doubt.

6. In cerebral cases, in cases of narcotic poisoning and in convulsive conditions such as tetanus, where there is interference with the process of swallowing, life may be prolonged and sometimes saved by forced feeding with a tube either through the nose or mouth. In the same way, in diphtheritic paralysis affecting the pharynx, feeding through a tube is of the greatest value.

2. STOMACH WASHING OR LAVAGE.

Methods and Apparatus.—A soft rubber catheter connected with a vulcanite funnel by eighteen inches of tube constitutes the best apparatus for stomach washing, as for gavage. The catheter used should be the largest that can

[1] "Gavage in the Treatment of Persistent Vomiting in Infants," *Archives of Pediatrics*, Feb. 1892, p. 85.



be easily passed and should have two or three eyes. Lukewarm ¾ p.c. salt solution is probably the best fluid to use.

The patient is made to sit or lie on his mother's knee, with his head looking towards her left side and his clothes protected by a mackintosh sheet. A slight pressure on his chin generally makes him open his mouth, and the catheter is then passed gently backwards over the tongue and down the œsophagus as already described (p. 247). When the stomach is reached, the funnel is momentarily raised to allow any gas present there to escape, and then the water is poured into it out of an ordinary jug.

In doing this one must be careful, especially in delicate children, not to over-distend the stomach by running in too much water at a time or by holding the funnel too high. When a sufficient amount of fluid has been introduced, the funnel is lowered, and the contents of the stomach rapidly fill it by syphon action and are emptied into a pail. The tube is then pinched to prevent the entrance of air, the funnel raised again and refilled, and the process of washing out repeated. It should be continued until fragments of curd, &c., cease to be found in the returning fluid.

Indications for Stomach Washing.—1. In "summer diarrhœa" or "milk-infection" stomach washing combined with irrigation of the lower bowel constitutes the most rational and successful preliminary treatment; and it is practically without danger if carefully carried out.

2. In all forms of chronic vomiting of gastric origin in children, irrigation of the stomach may be useful; but, owing to the practical difficulties met with in its application to older children, its use is mainly confined to babies. In many cases one washing out is sufficient to initiate improve-

ment in the symptoms; in others the process may have to be repeated daily for several days.

Not infrequently, an infant who has been vomiting several times a day for weeks, will cease altogether after one washing out of the stomach. This is often so even where, owing to blocking of the tube with curd, the irrigation has been very imperfectly done. It has also been found that in some cases the mere passing of the stomach tube and holding it in position for a minute or two exerts a very favourable influence on the vomiting. While a satisfactory explanation of this curious fact is not apparent, it has been observed sufficiently often to make it certain that the improvement that follows is more than a mere coincidence.

THE MECHANICAL TREATMENT OF THE BOWEL.

Our objects in making local applications to the bowel are five in number. *Firstly*, to stimulate it to evacuate its contents. *Secondly*, to cleanse, soothe or otherwise act on its mucous membrane. *Thirdly*, to soften retained fæces or to destroy parasites. *Fourthly*, to have food, fluid or medicine absorbed from it without passing through the stomach; and *fifthly*, to reduce an intussusception or a prolapse of the rectum.

For these purposes we make use of suppositories, injections of various kinds, and irrigations.

Suppositories.—Various kinds of suppositories are used to stimulate the action of the bowel in constipation. The simplest of these consist of small paper cones or conical



pieces of soap. These are very efficacious in many cases and are unobjectionable. Gluten suppositories are also made and act well. The most active suppositories are those containing glycerine. They are useful for many cases; but they must not be persevered with too long, as they are apt to give rise to catarrh of the rectum and sometimes seem to cause fissures and other troublesome complications.

Various medicinal substances which disagree with the stomach may be given in suppositories, but generally it is better to employ small injections. Nutrient suppositories are occasionally made use of in infancy, but they are unreliable and very apt to irritate and be expelled.

Enemata.—Evacuant injections may be composed of plain soap and water or thin gruel. During the injection the child should lie on his side, the fluid (at a temperature of 100° F.) should be injected very slowly and a certain amount of pressure exerted on the sides of the anus so as, if possible, to help its retention for a few minutes.

Injections of glycerine are very efficacious in *constipation*. A teaspoonful may be used plain or mixed with an ounce of warm water. In obstinate cases, from 2 drachms to an ounce of castor oil, or from 1 to 4 drachms of turpentine, may be added to an ordinary soap and water injection.

Injections of laudanum and starch are very useful in relieving *tenesmus* and some forms of *diarrhœa*. Two to three minims in half an ounce of starch may be used for a strong child of a year old. Subnitrate of bismuth (a teaspoonful or more in 4 to 6 ounces of water or mucilage) may be injected to soothe the mucous membrane of the lower bowel, and a solution of tannic acid (grs. 10 to 30 to the pint) is recommended as an injection in cases of

"summer diarrhœa" to render inert some of the animal poisons present in these cases.

When *hard masses of fæces* accumulate in the bowel, a preliminary injection of olive oil (½ to 1 oz.) is useful in softening them. It should, if possible, be retained for from four to six hours, and be followed by an ordinary soap and water enema.

To treat *thread worms* effectually, generally requires the use of enemata combined with internal treatment. A purgative, with or without santonine, is given the previous night in order to drive down the parasites into the colon. An ordinary evacuant enema is first administered to clear the bowel, and then 4 or 5 ounces of infusion of quassia or salt solution (a teaspoonful to 4 or 5 ounces) is gently injected and retained as long as possible.

The administration of *medicine* by the bowel is sometimes useful in an emergency when the patient is unable to swallow (*e.g.* chloral in a case of convulsions). It is also recommended in the case of some medicines which are difficult to give by the mouth because of their taste or their action on the stomach.

Nutrient enemata are of little use in early childhood, as in the cases where they might be useful they are rarely retained satisfactorily.

Injection of air or of water is frequently successful in reducing intussusception if it is of recent occurrence.

Irrigation of the Lower Bowel.—To irrigate the colon, an ordinary douche apparatus, such as is used in obstetric practice, is required with a large-sized rubber catheter at the end of the tube. The child is laid on a bed or table or on his nurse's knee in the lithotomy position, and a



large mackintosh sheet is placed under him draining into a pail below. The douche can is fixed four or five feet above the child. The catheter is then oiled and placed within the anus before the water is turned on. As the water flows, the catheter is passed steadily upwards for 12 or 14 inches, if possible.

At six months old, the colon will hold a pint without distention; and, at the age of two years, from 2 to 3 pints (Holt). As the irrigation proceeds, the water begins to be forcibly expelled by the side of the catheter, and the process should be continued until the water which returns is tolerably clean. At least a gallon of water should be used for each irrigation. After the injection is over, the water should be allowed to run out of the catheter and it should be left in for a few minutes for this purpose. A considerable proportion of the injecting fluid is usually retained for some time.

Irrigation is useful in effecting the thorough clearing out of the lower bowel.

It is soothing to the mucous membrane and has a beneficial effect in various forms of diarrhœa and also in some cases of recurrent colic. Plain water or solution of salt (a teaspoonful to the pint) seems to be as efficacious as an antiseptic solution.

CHAPTER XV.

ON FOOD DISORDERS.

FOOD ATROPHY AND DIGESTIVE DISORDERS.

A VERY important group of the diseases of children is that conveniently termed food or diet disorders. This name is applied to them because their commencement is frequently owing to something wrong with the quantity or quality of the food taken, and their continuance always depends largely on the character of the diet.

The fault in the food varies much in different cases. It may be merely a defect in the total amount or a want of one or more of the necessary elements; or there may be an active source of irritation from its containing indigestible matters, or poisons arising from decomposition or from the the action of germs.

When the food which a child is getting is unsuited to his necessities or his powers of digestion, this will soon be rendered evident by a change taking place in his health. The nature of this change may vary considerably.

1. It may be noticed that the child is *not thriving*, that he is *losing instead of gaining weight* and is wanting in vigour. This we call atrophy.

2. There may be one or more symptoms indicating that *the digestive organs are failing* to perform their functions properly and are becoming the seat of disease. There may, in other words, be some dyspepsia as shown by the occurrence



of flatulence, colic, vomiting, diarrhœa, constipation or some other symptom.

3. There may be indications of the presence of one of the *diseases due to perverted nutrition.* Of these there are two—rickets which is exceedingly common, and infantile scurvy which is comparatively rare.

I.—FOOD ATROPHY.

Atrophy, wasting or marasmus is a state of malnutrition characterised by more or less extreme emaciation with lowering of the vital powers and consequent interference with all the functions of the body. It is practically a chronic starvation of all the tissues, and it may occur under a variety of conditions.

Causes.—It may be due to *congenital syphilis* or *tuberculosis*, and in fact there are few serious and prolonged diseases in which it does not occur.

By far the most important, because the commonest, form of wasting, however, is food atrophy or athrepsia as M. Parrot called it. Food atrophy may be due to simple *starvation* intentional or unintentional; the food given either not containing enough nourishment for the child to thrive on or containing it in such an indigestible form that the child is unable to assimilate it.

More frequently, however, it is to be regarded as merely a symptom of *impaired digestion.* Sometimes it is obviously the result of vomiting and diarrhœa; but often the wasting itself is the most marked, if not the only, indication that the digestive organs are failing to appropriate to the child's use the nourishment contained in his dietary.

Although the food factors in the causation of this form of

atrophy are the most obvious there are also others which are very important. The chief of these are, *congenital debility* (due often to anæmia and weakness of the mother during pregnancy), and *unfavourable hygienic conditions* such as damp foul air and absence of sunshine. When such predisposing causes exist, a much smaller error of diet will be sufficient to induce atrophy than would be required under ordinary circumstances.

Symptoms.—The symptoms vary according to the stage of the case. The first thing noticed is that the child is not gaining weight, and it is soon found that he is actually losing. The loss may not at first be apparent, unless he is regularly weighed, but soon it is only too evident. The baby becomes emaciated and pale, his features are sharp and thin instead of being rounded and chubby (Fig. 45), and the fontanelle is depressed below the level of the surrounding bones. The muscles are small, weak and flabby. The skin is loose and lies in folds on the limbs. When you pinch it up lightly between your finger and thumb, it is inelastic and remains unnaturally in the folds in which you put it. Its surface is often dry and harsh from branny desquamation of the epidermis. The temperature is low, often much lower than normal—reaching sometimes below the range of an ordinary clinical thermometer and in severe cases even below 90° F. The extremities are usually slightly cyanosed.



FIG. 54.—Food Atrophy. Boy, aged 7 Weeks.



There is also, generally, more or less vomiting with irregularity of the action of the bowels, sometimes constipation but often diarrhœa. The child is extremely peevish and cries passionately, sometimes he takes the bottle ravenously, sometimes he is listless and apathetic. There is often thrush in the mouth, and frequently there are patches of erythema and excoriations in the groins and about the anus and genitals. There is also a tendency to the formation of boils and subcutaneous abscesses.

Diagnosis.—The presence of atrophy is easily recognised, but it is sometimes difficult, at first, to be sure whether a case is one of food atrophy or whether there is not some constitutional disease present that accounts for the wasting. In examining a case, congenital syphilis and tuberculosis should always be borne in mind, besides local diseases such as empyema which may occur even in the first few weeks of life.

If syphilis is present, there will generally be something suggestive in the history of former children if not in that of the mother; or else the patient may have snuffling breathing or a hoarse cry, or traces of some characteristic skin eruption about the anus, on the eyebrows or elsewhere (p. 52).

Tuberculosis is more difficult to make sure of. If the family history is bad, or if there are indications of consolidation of the lungs, these are points in its favour; but it is well to remember that a great many children are put down as tubercular who turn out to be merely suffering from the results of injudicious feeding.

Careful watching of the progress of the case and of the effect of treatment will generally decide the matter.

Prognosis.—The result of treatment depends on the stage

[redacted] which it has begun and on the possibility of improving the patient's condition. In severe cases, the prognosis should be very guarded. In these children, the subjective symptoms are slight, and this is apt to lead to the danger being underestimated.

Termination.—When the case is not taken in time, the child gets weaker and weaker, and dies from some complaint which would probably have done no harm to a healthy infant. For example, a slight chill may lead to bronchitis, passing on rapidly to pulmonary collapse and pneumonia; or an aggravation of the vomiting or diarrhœa may prove speedily fatal. If vomiting is present there is a constant risk of regurgitated fluid being drawn into the air passages and giving rise to suffocation from "inhalation pneumonia."

Not infrequently, wasted babies die suddenly, without having shown signs of any distress, and, on post-mortem examination, it appears that death has been due to embarrassment of the respiration and circulation by an extreme distention of the stomach with wind. Whether this is due to decomposition of the food in the stomach or to the infant's having swallowed air is difficult to decide.

Treatment.—The treatment of atrophy consists mainly in giving the child the most nourishing diet that he is able thoroughly to digest. There is nothing so likely to succeed as breast milk, and many infants are saved by wet nurses who would certainly otherwise die. When a wet nurse cannot be employed, as is of course frequently the case, something as nearly as possible equivalent to human milk must be provided. In moderately severe cases a cream mixture (*e.g.* Rotch's) may suit well, and some babies who



cannot digest this may be able to take some form of pancreatised milk with advantage.

The food must be given with the utmost regularity, great care being taken that the child does not drink too rapidly or too much at a time. Sometimes 5 to 10 drops of whisky, well diluted, may be given before each bottle. The inunction of neat's foot or cod liver oil is often useful, and benefit is occasionally derived from periodic washing out of the stomach with warm water.

The hygienic surroundings must be seen to and regular baths given. Draughts and exposure should be guarded against and the room kept carefully heated. In bad cases it is well to keep the child wrapped up in cotton wool.

When there is *irritation of the skin* about the anus or elsewhere, the parts should be smeared with zinc ointment.

Boils are due to infection with pus-producing organisms. They should be opened early, the surrounding skin being first carefully cleansed with corrosive solution (1 to 1000) and an antiseptic dressing applied.

II. DIGESTIVE DISORDERS.

The digestive disorders of children form a large and perplexing subject, and, until our knowledge of it is greater than it is at present, it is safer to speak of cases of this nature by the names of their most prominent symptom than to employ terms which indicate the supposed morbid anatomy. The local morbid changes found in these cases are certainly more often the result than the cause of the functional abnormalities.

It is far better, for example, to speak of a case as one of

diarrhœa, however vague and unscientific this may sound, than to use the term "gastro-enteritis" unless we are sure that that condition is present. Even when there is evidence of catarrh it may be preferable to keep to the term diarrhœa, as the local change in the mucous membrane is generally merely an incident in the course of the main disease or a result of it.

We shall begin therefore with a consideration of the significance, causation, and treatment of the principal symptoms which indicate derangement of the digestive organs, *viz.* flatulence, colic, vomiting, diarrhœa, and constipation; and shall then deal shortly with a few of the commoner disorders of the gastro-intestinal tract.

A. SIGNS OF IMPERFECT OR DERANGED DIGESTION.

FLATULENCE AND COLIC.

These symptoms frequently occur together. They may be present when there is neither vomiting nor diarrhœa although often associated with these symptoms.

Causes.—*Gastric flatulence* may arise from fermentation of the food in the stomach, but it is frequently due to the infant's sucking air from the empty mouth-piece of a feeding-bottle or swallowing it along with his milk. It is often noticed when the baby takes the bottle too greedily.

Flatulence in the bowel arises from decomposition of its contents with the formation of gas. It is apt to be set up when there is too much indigestible matter (*e.g.* starch) in the food.

Colic may be due to the presence of wind or of irritating substances arising from chemical decomposition, or to the mechanical irritation of scybala. It is often complained of in cases of chronic constipation. It may also be caused reflexly, *e.g.* by cold feet.

Diagnosis.—The presence of colic is easily recognised by noting the child's behaviour when an attack comes on. The pain makes him cry and, during the paroxysms of crying, he flexes the legs on the thighs and the thighs on the abdomen, bending up the arms also and clenching the fists. After this has lasted a very short time, some wind may pass and the pain is at once relieved, although it will probably soon recur.

There is generally no difficulty in recognising the nature of the pain in a case of colic. Long continued or frequently recurring abdominal pains, however, are sometimes caused by spinal caries and these are not infrequently mistaken by the parents for colic.

Treatment.—When the *flatulence* is due to the swallowing of air along with the food, a change in the method of its administration may diminish or stop it. A sick infant who is being fed out of a small spoon and is gulping down air each time, will swallow less wind if a large spoon is used, and probably none at all if he is skilfully fed from a bottle or with a syringe and tube (p. 249). If the air is swallowed during the process of sucking from a bottle, care should be taken that the rubber teat is full of milk when the child sucks it.

If the flatulence is due to fermentation, its treatment is mainly prophylactic, *i.e.* regulation of the digestibility and quantity of the food and of the way in which it is taken.

Alkalies with a carminative (F. 16) or with pepsin or papain (F. 17) are also sometimes useful.

The best immediate treatment of an attack of *colic* consists in irrigating the lower bowel with a large quantity of warm water or administering a copious warm enema. The application of hot fomentations to the abdomen and of warmth to the feet are also serviceable, and twenty drops of whisky or a dose of carminative may help to relieve the child. An aperient is usually indicated to clear away irritating matters, and if the bowels are habitually constipated this should be attended to.

In cases where there is obstinate recurring colic, small doses of codeine ($\frac{1}{32}$ to $\frac{1}{24}$ of a grain) are occasionally useful as a temporary palliative while the diet is being gradually regulated. The alleviation thus produced encourages the mother to persevere. Older children who have chronic indigestion accompanied by recurrent colic are often relieved by small doses of Fowler's Solution (m. i.) taken immediately before meals.

VOMITING.

Vomiting occurs more frequently and more easily in children than in adults. It is by no means always a sign of disease of the stomach, and it is often met with under other conditions.

Causes.—1. In *acute febrile diseases* vomiting is often one of the first symptoms noticed. This is so in pneumonia and also in scarlet fever and some of the other exanthemata. It may also be a symptom of uræmia and other renal conditions.

2. In *meningitis* and other *cerebral affections* it is an



important symptom, and, whenever we have obstinate and long continued vomiting, we should remember the possibility of its being cerebral. It may be impossible to discriminate cerebral from dyspeptic vomiting in infants by any special characters, the relation to food affording little help in their case owing to the frequency of their feeding.

3. *Intestinal obstruction* from intussusception, peritonitis or other local disease must always be borne in mind as a possible cause of vomiting.

4. *Reflex vomiting* is occasionally met with. It may be due to irritation in connection with worms or teething or the ears.

5. In older children, especially girls, there is sometimes *hysterical vomiting* without any local disease.

6. Vomiting sometimes occurs mechanically and apart from stomach disease in cases where there is *severe coughing*, the food being brought up by the violence of the cough. This occurs chiefly in whooping-cough.

Generally, however, vomiting is due to *local irritation of the stomach.* You may find a simple regurgitation of milk occurring soon after nursing owing to the infant having taken too much; the stomach gently rejecting the surplus which would otherwise interfere with digestion. This is met with in strong and healthy infants on the breast. The milk comes up with no effort or discomfort and runs out of the corners of the mouth. If the child is thriving no special treatment is necessary, but his meal may be shortened and he should be kept quiet after it.

Dyspeptic vomiting differs from this condition in being accompanied by more or less retching and discomfort, and in the fact that the contents of the stomach are expelled

with some force. It occurs also after small quantities of milk.

DIARRHŒA.

Diarrhœa is a symptom of the greatest importance in childhood, because of the number of deaths which it causes and the amount of ill-health to which it gives rise. The term is a vague one, for it may be applied to any case where the motions are too many, or too large, or too loose (even when normal in number); and it is applicable whether they are mainly composed of undigested food or of blood and mucus or of other perverted secretions.

Causes.—Diarrhœa is, as might be expected, characteristic of various totally different conditions, for example—

1. It may be due, like vomiting, to some *general poison* like that of scarlet fever, measles, pneumonia, septicæmia or uræmia.

2. It is often merely *reflex or functional*, and no more organic in origin than sea-sickness. Thus it may arise from a sudden chill or wet feet, or from emotional causes, or even, possibly, from the reflex irritation of teething. Lienteric diarrhœa also belongs to this class.

3. It may be a symptom of *organic disease of the intestine* such as ulceration, waxy disease or catarrh.

4. Most frequently, however, it is due to *local irritation of the bowel* by its contents, and it represents nature's attempt to get rid of what is really or virtually a foreign body. Thus it is often the result of indigestible or at least undigested food, or of worms or other foreign bodies, and in a large proportion of cases it is kept up by poisons produced by the local action of germs in the alimentary canal, even when it has begun from other causes.

The treatment of vomiting and diarrhœa must depend on their cause, and will be considered along with that of the conditions which most frequently give rise to them.

CONSTIPATION.

Causes.—Insufficient or infrequent evacuation of the bowels short of obstruction may be due to various dietetic and other causes. Sometimes, for instance, it is a symptom of *cerebral disease* or of *congenital malformation of the bowel.* Occasionally it may depend on the presence of a *fissure or ulcer at the anus* which causes the child so much pain that he instinctively restrains the action of his bowels as long as possible. These cases are not common, but they are important because of the special treatment which they require. In the great majority of cases the symptom is connected with *want of tone in the lower bowel,* which in children is relatively longer than in adults, or with *diminished intestinal or biliary secretions* and an excessive secretion of mucus.

There are usually also *dietetic causes* in operation. If the child is on the breast or bottle, the constipation is often due to a deficiency of cream or an excess of casein in the milk. Infants nursed by mothers who are constipated are often similarly affected. In older children the constipation may be due, as in adults, to the foods given being too completely digestible; occasionally, however, such things as porridge and fruit given in large quantities for laxative purposes, if they interfere much with the digestion, seem to increase constipation instead of relieving it.

Treatment.—In the case of nursing infants, treatment of the mother's constipation may benefit the child.

If there is a *local cause* it must be attended to. Measures should also be taken to *improve the general tone.* If rickets is present, it should be treated, and in older children cold douching and regular exercise are often useful.

It is always important that the baby should get into the *habit* of expecting to have his bowels moved regularly at a certain time of day. Even young infants may be taught, if they are always placed on the chamber at the same hour, and it is better that this should be done just after a meal. The use of a *soap or glycerine suppository* is often useful in helping to establish regular habits. Small *enemata* of glycerine and water may also be used, but copious injections should be avoided as tending to distend and further relax the lower bowel.

Massage of the abdomen, if properly applied in the direction of the colon, is often very efficacious. It may be done two or three times daily for ten minutes at a time, most attention being given to the region of the sigmoid flexure.

The *diet* must be carefully attended to. In babies an increase of cream or of sugar is often sufficient, or the addition of barley water or oatmeal water to the milk. Sometimes one of the malted foods (*e.g.* Mellin's) is useful. For older children, porridge, fruit and vegetables are usually indicated. Fruit is especially efficacious if given before breakfast, and a roasted apple at this time will, in the case of some children, render laxative medicine unnecessary. Indigestible articles and an excess of farinaceous food are to be avoided. Cream and cod liver oil are often laxative in their effects and extract of malt is often successful in the same way.

Medicine should be used as little as possible in the treatment of constipation, but in certain forms of the condition some drugs are of considerable value. Probably the most useful for infants and young children is magnesia. The best form is the powder, of which 5 to 10 grs. may be given two or three times a day, to begin with. If this amount proves insufficient, it should be steadily increased until the motions become sufficiently soft to pass easily (Cheadle). Magnesia, given in the same way, is also often useful in older children.

Phosphate of soda has a similar action to magnesia and may be given in the same doses, but it is not so reliable in its action.

Tincture of podophyllin is often useful in obstinate constipation in babies with dry white stools. It should be given in doses of three minims, two or three times a day, and one minim can be added to the dose every second day until the action of the bowels is satisfactory.

Compound liquorice powder and cascara sagrada, in some of its less bitter preparations, are suitable and useful laxatives for older children, and a short course of mineral waters is sometimes of benefit.

B. COMMON FORMS OF DIGESTIVE DISTURBANCE.

ACUTE INDIGESTION.

Causes.—This condition is generally due to the child having swallowed something which is so unsuitable as food as to give rise to local irritation in the bowel or stomach or both. In infants, *over-feeding* is a common cause of in-

digestion. The child may get the bottle too often or too much at a time (perhaps to quench thirst), or the milk may be too *concentrated*, or other things may be given along with or instead of it which are *not fully digested* and therefore cause irritation in their passage downwards. *Sour milk* or milk which is *tainted with some impurity* is probably the most frequent cause.

In older children *foreign bodies*, and *undigested articles* which act as such, are often to blame. Currants and raisins, raw fruit and vegetables, hard and unchewed fragments of potato and meat are examples of this. We must also remember that indigestion may be caused by *drugs* such as cough mixtures, iron preparations, &c.

There are, however, other elements in the causation besides the nature of the food. The child may be so *delicate* that carefully chosen food sets up irritation. *Teething* has certainly in some cases an influence in so disturbing the nervous system that causes set up diarrhœa and vomiting, while it is proceeding, which at other times would be unable to do so. *A chill* from insufficient clothing, and sitting on cold and damp seats is a frequent and important cause.

Symptoms.—Indigestion gives rise at first to restlessness, languor, discomfort and flatulence, and these are apt to be soon followed by vomiting, and later by colic and diarrhœa. At the beginning the motions are normal, later they become loose and watery. In infants they tend to assume a green colour. There is usually considerable relief for a time after a motion until the pains begin again. After the first few motions, however, there is not usually much pain. The temperature may be up at



first but rarely continues high after the first few hours. Emaciation takes place rapidly.

If the cause ceases, the symptoms generally subside in two or three days, but if it continues to act they go on indefinitely. If the case lasts long and is severe, the vomited matter and motions become slimy from the presence of an excess of mucus, and this indicates the presence of catarrh.

Treatment.—If there is reason to suspect that the child has recently had an indigestible meal, an emetic is indicated and may often cut short the attack. In most cases, unless the diarrhœa has already been severe, it is well to assist nature to get rid of the irritating matter by giving an aperient such as a teaspoonful of castor oil or syrup of rhubarb.

In an infant, if the case is a severe one, the most important thing to do is to *stop all milk for many hours* (twelve to twenty-four) giving only an unirritating fluid such as barley water, or white of an egg and water (Appendix D), or, plain sterilised water in small quantities every hour or so during this time. In older children, a similar line of treatment is to be followed, but the patient may often, with advantage, be allowed boiled milk diluted with barley water or potash water.

For *medicinal treatment*, small doses of grey powder with soda and bismuth (F. 18) may be given every two hours, or a bismuth and soda mixture (F. 19). Small doses of castor oil are also very efficacious (F. 20). If the diarrhœa persists, small doses of laudanum may be added.

It is important to guard against relapse by a very careful *regulation of the diet* for some time after an attack, even if

obvious indiscretion has been the cause of it. When anything in the habits or dieting has led to the attack, this must of course be seen to, at once.

CHRONIC DIARRHŒA.

Causes.—This condition may be primary—due, that is to say, to a continued derangement of function which often gives rise, after long duration, to various lesions of the bowel (mostly the large bowel)—and it may be the result of constitutional weakness and injudicious feeding or of chronic (*e.g.* septic) poisoning. It may also be secondary, arising from a damaged condition of the intestine left by an acute inflammatory attack or some other disease.

Food which is positively or relatively unsuitable is the main cause of the continuance of the diarrhœa. The action of micro-organisms also plays a certain part. No special toxicogenic bacteria are required to account for the intestinal lesion. When the digestion is interfered with, those micro-organisms which are normally present in the bowel multiply enormously and constitute a further source of irritation.

Symptoms.—The main symptom is, of course, the change in the character of the motions, which are generally increased in number and always much altered in character. They vary greatly in appearance in different cases. Sometimes they contain obviously undigested food, fragments of milk curd, fatty matter, farinaceous food or fruit. Sometimes, especially in babies, they are of a bright green colour, sometimes yellow or brown, and sometimes they are large, pulpy and of a putty-like appearance. They are often extremely offensive. The mother's description is usually



unreliable and it is always well to insist on seeing the motions if a child is not thriving.

The child gets gradually weaker and thinner, nervous and irritable. The appetite often remains good, sometimes it is excessive and the child will eat far too much if it is put before him. The tongue is usually dry and red and it may be coated. The skin round the anus is apt to be irritated and sometimes prolapse occurs. There is occasionally considerable œdema of the lower limbs, without any nephritis.

The duration of the diarrhœa varies. If not energetically treated it may continue indefinitely. Often there are acute exacerbations from time to time. If the case ends fatally, death is due to one of these or to some intercurrent disease such as bronchitis, pneumonia, or nephritis.

Diagnosis.—The lungs and other organs must be carefully examined for signs of disease, especially for tuberculosis, and the child's personal and family history enquired into. Long continuance of the diarrhœa is not, of itself, a sufficient reason for regarding the case as tubercular.

Prognosis.—This varies much, according to the nature of the cause and whether it can be removed. It depends a great deal on the willingness and ability of the parents and nurses to carry out their instructions literally, and to some extent also on the hygienic surroundings.

Treatment.—A thorough revision of the diet is the most important thing, and, while this is being attended to, the child should be regularly weighed in order to ascertain his progress. In severe cases in young infants, nothing is so beneficial as the milk of a good wet nurse. If the baby is on the bottle we must investigate whether he is having too

much casein or sugar or cream, also whether the food is being prepared with due care as to cleanliness, and given in reasonable quantities and at proper intervals. In bad cases, it is usually necessary to stop milk altogether and to give only meat broths, raw meat juice, or white of egg water (Appendix D), for a time, or in older children some form of bland farinaceous food such as arrowroot.

It is, generally, either the proteids or the carbo-hydrates which cause difficulty in digestion. Professor Vaughan says[1] that, if it is the proteids, the stools are alkaline and putrid, and, if the carbo-hydrates, they are usually acid and associated with gas formation. If we can get a clear indication as to which element of the food is at fault, it is important to stop that element at once; and, if we cannot be sure, it is far better to stop one of them experimentally than to go on with a mixed diet. Often, the substitution in place of milk, of cream, diluted with barley water or whey or potash water, is at once followed by improvement.

Fresh air is essential and the patient may benefit greatly from a change to the country. He must also be carefully and warmly clad. As for medicines, bismuth is useful in large doses (grs. 8 to 16 or more every three or four hours, F. 21), and resorcin, salol, salicylate of soda and grey powder are sometimes useful. Irrigations are sometimes followed by improvement. Dilute hydrochloric acid (2 minims every two to four hours) is often of great value, and occasionally small doses of opium may be added to it with advantage. It is better, however, to avoid the use of opium, if possible. Alcohol is often very useful, and, when

[1] "Diarrhœal Diseases," Starr's *Text-book of Diseases of Children*, p. 486.



the patient is recovering, tonics such as arsenic, nux vomica and cod liver oil should be given.

CHRONIC VOMITING.

Causation.—When long continued and severe, vomiting generally indicates the presence of gastric catarrh, in which there is an excess of mucus secreted and too little gastric juice. At the post-mortem in such cases, there is usually little organic change to be found. The vomiting is often due to unsuitable food, such as sour milk, or to too large quantities of food, or to the meals being given at too short intervals.

Symptoms.—Along with the persistent vomiting there may be constipation or purging, and the child's general nutrition suffers in the same way as in diarrhœa.

Diagnosis.—In investigating the causation of obstinate vomiting in children, the possibility of its being cerebral must always be borne in mind, and special attention given to ascertain the previous state of the digestion, the present state of the pulse, and whether any other symptoms of cerebral disease are to be found. When persistent vomiting occurs in new-born children without intestinal obstruction, it may be due to the obscure disease which causes congenital hypertrophy of the pylorus, or to some other congenital malformation.

Treatment.—The first indications in a case of chronic vomiting are to *rest the stomach* and *regulate the diet.* The intervals between the meals may have to be lengthened and the details of the feeding must be carefully attended to. In young babies, nothing succeeds so well as a wet nurse. In hand-fed infants, the milk should be discontinued for a time,

and raw meat juice and barley water, or white of egg and water given in its place. Occasionally peptonised milk is helpful, and Mellin's food and some of the farinaceous foods may be temporarily useful.

Washing out the stomach is almost invariably beneficial, especially in the case of young babies. It is more difficult and less satisfactory in older children (p. 251). The great advantage of gavage in severe cases has already been referred to (p. 250). The most generally beneficial medicine for these cases is bismuth with or without an alkali (F. 19 and 21), and drop doses of Fowler's solution or of ipecacuanha wine, immediately before each meal, are useful in many cases. Dilute hydrochloric acid, nux vomica, and creasote (F. 22) are all occasionally of value, in small doses.

LIENTERIC DIARRHŒA.

Causation.—This is a form of diarrhœa which is not due to injudicious feeding, but to an over-excitability of the nervous system. It is met with commonly in children about five or six years old, but sometimes occurs at a much earlier age, as well as in older children.

Symptoms.—In these cases the taking of food sets up an undue amount of peristalsis in the bowel, so that the children are interrupted in their meals by griping pains, and have to leave the table hurriedly to have their bowels moved. The motions are composed of indigested food and mucus.

Treatment.—The condition is not benefited by astringents, but is generally rapidly cured by the administration of Fowler's solution of arsenic in drop doses immediately before each meal. A drop of tincture of nux vomica may be



added to the arsenic. If the case is obstinate an opiate may also be given, but this is rarely found necessary.

SUMMER DIARRHŒA.

Summer diarrhœa is a form of acute diarrhœa which prevails, during the summer, in large towns where the mean temperature rises above a certain level; and which causes a high mortality.

Causation.—Although the etiology is still obscure in several respects, many facts are known about its predisposing and exciting causes.

The principal predisposing causes are three in number: (1) a high mean atmospheric temperature; (2) early age; and (3) a weakened and deranged condition of the alimentary mucous membrane.

1. *High mean atmospheric temperature.*—When, in a town, the temperature of the air is constantly above 60° F. the mortality from this disease is always high. If even a little below that level, the disease is much less severe. Changes in the atmospheric conditions other than rise of temperature (winds, humidity, &c.) seem to have no special effect on the prevalence of summer diarrhœa.

2. *Early age.*—The disease is one of early infancy, occurring almost exclusively during the first two years of life.

3. *A weakened or deranged condition of the alimentary mucous membrane.*—In this, as in other forms of diarrhœa, any general or local condition which irritates or weakens the structure or functions of the digestive organs is to be regarded as a predisposing cause. Babies on the breast are seldom affected compared with those who are hand-

fed; and those who are badly nourished, and those whose digestive organs are irritated by improper feeding, are especially liable to be infected and to suffer severely.

The exciting causes consist in the multiplication of micro-organisms in the alimentary canal, and in changes in the chemical composition of its contents.

1. *Micro-organisms.*—In the causation of these cases "there is not a specific micro-organism, as there is in tuberculosis, but any one or more of a large class of germs, the individual members of which differ from one another sufficiently, morphologically, to be regarded as distinct species, may be present, and may produce the symptoms" (Vaughan[1]). These bacteria are of the ordinary species which normally inhabit the child's alimentary canal. Under normal conditions, their action is beneficial, but, in cases of summer diarrhœa, they multiply enormously, and their products act as severe general poisons as well as local irritants to the mucous membrane of the digestive tract.

The poisons produced differ in the degree of irritation to which they give rise. Some of them have been separated and administered to animals, and have been found to cause choleriform symptoms. In the great majority of cases the germs are introduced along with cow's milk. Milk is a congenial medium for them to grow in, and they multiply and flourish in it both inside and outside the child's alimentary canal.

2. *Chemical Changes in the Contents of the Stomach and Bowels.*—The exact rôle which chemical changes play in the causation of these cases is difficult to ascertain. While

[1] *Loc. cit.*



lesions of the mucous membrane and general intoxication are certainly produced by the products of bacteria, it seems exceedingly probable that the abnormal multiplication of these is often secondary to a functional chemical change in the contents of the stomach and bowel (Baginsky).

Symptoms.—Summer diarrhœa may be met with in the terribly acute form called "cholera infantum," because of the close resemblance which its symptoms present to those of real cholera, or in the less severe variety which resembles an unusually severe attack of dyspeptic diarrhœa and vomiting. The cases which are met with in this country are mostly of the latter type.

The patient is in the majority of cases a hand-fed baby. Sometimes he seems in good health, when the severe symptoms commence. Very often, however, he has been suffering for some time from digestive disturbance, so that the diarrhœa and vomiting appear as an exacerbation of a chronic or subacute attack.

Before the vomiting and purging begin, the patient is restless and distressed, and his temperature is raised perhaps to 102°, 103°, or even 104° F. After a few hours of discomfort, the child vomits, first, undigested food, and later watery mucus tinged with bile. Any fluid given to allay thirst is at once returned, and soon the diarrhœa commences. At first, ordinary fæces are passed, along with much wind, and preceded by colicky pains. The motions succeed one another rapidly; their yellow colour changes to pale green, grey or brown, and they are very offensive. Finally, they have often the appearance of reddish serum. There may be ten, twenty, or more motions in the twenty-four hours.

After the first motion the temperature often falls, and the patient seems more comfortable. He loses flesh very rapidly, his eyes sink in (Fig. 12, p. 52), his fontanelle is much depressed, and he is exhausted by the repeated purging and vomiting. The extremities become cold and clammy, the abdomen is soft and retracted.

Under suitable treatment, or even in slight cases without it, the diarrhœa and vomiting gradually cease, and the child is convalescent after a week or less. If the patient is weakly, or the attack a severe one, or the feeding injudicious, the symptoms may get worse. The temperature keeps up, the prostration increases, and the child may take fits or fall into a state of stupor, from which he does not awake. Sometimes, as the acute symptoms subside, the case passes into one of chronic diarrhœa.

The extremely severe and really choleriform attacks, which are properly called cholera infantum, differ from those just described mainly in their severity. The same symptoms occur, but they set in more suddenly and are more severe in every way, and, if not checked, they are much more rapidly fatal.

Prophylaxis.—A great deal can be done towards the prevention of summer diarrhœa by attention to general hygienic precautions. It is important, when this disease is prevalent, not to allow any child to be weaned unnecessarily, the number of breast-fed babies affected being very small compared to that of those on the bottle.

Cleanliness in the milk supply, and especially sterilisation of the milk used for the baby, and keeping it cool before use, are also very important. It is not only important to observe the greatest cleanliness in connection with the



milk, but the nurse should disinfect her hands each time after touching the diapers or anything soiled with the motions. The motions, and anything soiled with them, should be carefully disposed of at once. All derangements of the digestion should be promptly and carefully treated.

Treatment.—The principles involved in the treatment of these cases resemble those applicable in acute poisoning:—(1) The irritating material must be cleared out of the stomach and bowels; (2) the introduction of fresh causes of irritation in the food prevented; (3) antiseptics; and (4), if necessary, sedatives should be given.

1. *Evacuation of the stomach and bowel.*—The first indication is to remove as much as possible of the poison from the alimentary canal. For this purpose we wash out the stomach at once (if there is any vomiting) with warm water or salt solution. This must not be put off under the idea that the child is too weak. If the child is very weak it makes it all the more urgent to do all that can be done as quickly as possible to remove the poison which is affecting his strength. A few ounces of water may be left behind in the stomach to allay the thirst.

The lower bowel may also be washed out with warm water, and it is recommended by American authorities to leave in it about a pint of cold water containing 15 to 20 grs. of tannic acid. The tannic acid is for the purpose of rendering inert any soluble ptomaines which may be present. The small intestine can only be reached by purgatives, and calomel (grs. 3 to 5) or castor oil may be used for this purpose.

2. *Stopping all food.*—The child should have no food for twenty-four hours, and for from two to four days, according

to the severity of the case, he should have white of egg and water, or raw meat juice and barley water, or meat broths, and *no milk.* The digestion is quite at a standstill, and therefore more nourishing food can do nothing but harm. Milk, even if it does not contain the poison which is causing the disease, is the best culture-medium for the micro-organisms which are producing it in the child's body, and is therefore very dangerous.

In many cases, clearing out the alimentary canal, stopping the milk for two to four days, and properly regulating the diet is all that is necessary to stop the attack. There are, however, various auxiliary measures which may be useful.

3. *Antiseptics.*—Antiseptics are sometimes useful, but their value has been greatly exaggerated. The amount that can be given must always be very small compared with the matter to be disinfected. Calomel (gs. $\frac{1}{12}$ gr.), grey powder (grs. $\frac{1}{6}$ to $\frac{1}{4}$), salol (grs. 1), resorcin (grs. 3 to 5), or subnitrate of bismuth (grs. 10) may be given every hour or two hours. Dilute hydrochloric acid (1 to 3 minims) well diluted every two hours is also very useful. These medicines often help in allaying the vomiting. Astringents are of no use.

4. *Opiates.*—Opium may be required if the motions are very frequent or accompanied by much pain. It is never to be given before the clearing out of the alimentary canal, and it is best administered separate from other medicines, so that it can be stopped when it is no longer required. Compound ipecacuanha powder, laudanum, and nepenthe are convenient forms in which to give it. Hypodermic injection of morphine (grs. $\frac{1}{100}$), repeated, if without effect,



in an hour, is sometimes very useful; and an enema of starch and laudanum is also efficacious in some cases. A mustard bath or a large mustard poultice forms a useful auxiliary measure.

PROLAPSUS RECTI.

There are two degrees of prolapse of the rectum. In the slighter form, the prolapse consists of a ring of swollen mucous membrane which protrudes through the anal aperture when the child strains. In the severe variety, the whole thickness of the wall of the rectum is involved, so that the protruding bowel corresponds to the invaginated portion of an intussusception. In these cases, the prolapse is often two or three inches long, and it may remain constantly down.

Causation.—The greater tendency to prolapse which obtains in early life is attributed to many things. For example, the sacrum is less curved in children, the rectum straighter, and the muscles in the pelvis weaker and more yielding. Rapid wasting, such as is frequently seen in this condition, must also predispose to prolapse by diminishing the support afforded to the rectum by the ischio-rectal fat before the muscles have time to accommodate themselves to the greater strain thus thrown upon them. The exciting cause is severe and long continued straining. This may result from constipation, from thread-worms, or from diarrhœa associated with catarrh of the rectum. Extreme phimosis may also lead to it, and in older boys it is sometimes a symptom of vesical calculus.

Symptoms.—When slight in degree the prolapse only

occurs during defæcation, and is readily returned. In severe cases, however, any exertion, such as crying and coughing, brings it down, and it is more difficult to return satisfactorily. When it remains long down, it is apt to become inflamed and ulcerated.

Treatment.—The protruding bowel should be washed with cold water, and gently returned by pressure upwards with an oiled rag. The child should be kept lying for some time after it is returned. The treatment of the morbid condition which gives rise to the straining must be undertaken, and the administration of an iced water enema night and morning is often very helpful. To lessen the tendency to recurrence of the prolapse, the child should be encouraged to relieve his bowels when lying on his side; and, if he uses the chamber, it should be placed in such a position that his legs are not touching the ground, so that he strains as little as possible.

When the tendency to prolapse is so great that protrusion of the bowel occurs apart from defæcation, the patient should remain in bed, and his nates should be kept tightly together by means of broad straps of adhesive plaster, which are changed when the bowels move. This is a very effective measure. In severe cases, strychnine has been recommended either as an ointment or in hypodermic injections ($\frac{1}{100}$th of a grain twice daily in a child of two years (Holt); and if everything else fails, the prolapsed portion of bowel may be cauterised in such a manner as to cause cicatrisation of its mucous membrane.



CHAPTER XVI.

ON FOOD DISORDERS (RICKETS AND SCURVY).

RICKETS.[1]

THERE are few of the diseases of children so important as rickets, because of the frequency of its occurrence, the large mortality which it causes secondarily, and the fact that it is generally an eminently preventible and curable condition.

Rickets is sometimes spoken of as a disease of the bones, and it is true that alterations in the skeleton form its main peculiarity from a pathologist's point of view. From a purely clinical standpoint, however, these may be regarded as less important than some of the other manifestations of the disease. Rickets therefore is not a bone disease, properly speaking, but a general disease of the nutrition,

[1] The student will find much valuable information on the subject of Rickets in the following works:—*The Disorders of Infantile Development and Rickets*, by A. Schœpf Merei, M.D., London, 1855; *Clinical Lectures and Essays on Rickets*, etc., by Sir Wm. Jenner, M.D., G.C.B., London, 1897; Article "Rachitis." *Keating's Cyclopædia of the Diseases of Children*, Vol. ii., by Thomas Barlow, M.D. and J. S. Bury, M.D.; Article "Rickets." *Allbutt's System of Medicine*, Vol. iii., 1897, by W. B. Cheadle, M.D.

which affects the bones in a more characteristic manner than the other tissues.

CLINICAL FEATURES.

Frequency of Occurrence. — Rickets is one of the commonest diseases of early childhood. In Edinburgh rather more than 50 per cent. of the children under three years old attending the out-patient department of the Children's Hospital show unmistakable signs of it. In larger towns, such as London, Glasgow, and Manchester, it is said to be even more prevalent. In Vienna, according to Kassowitz, 80 per cent. of the poor children under three years old are rickety. The disease is, of course, most frequent and most severe among the poor, but among the upper classes also mild cases are very common.

Age of Onset.—Rickets is a disease of early infancy. Occasionally infants are born with undoubted signs of it, but generally no trace of the disease can be discovered until after three or four months. It is probable that in all cases of rickets the disease begins during the first year of life, although it is certain that a large proportion of them are not brought for medical treatment until the second year, and some even later. The degree to which most of the characteristic bone changes take place in the thorax, back and limbs, depends largely on the amount of movement of, and pressure on, the parts affected. Consequently, it is only when the scope of the child's activities enlarges, that these deformities begin to obtrude themselves on the parents' notice and to arouse their alarm. In rare cases



the severe bone symptoms only develop in later childhood, or it may be even in adolescence.

The clinical manifestations of the disease may for the sake of convenience of description be divided into (*a*) the *symptoms*, *i.e.*, what the mother first notices about the child —including the digestive and respiratory complications; and (*b*) the *physical signs*, which the medical man discovers on examining the patient.

(*a*). **Symptoms.**—In most cases, the first symptom which the mother notices is *excessive perspiration.* This is most marked on the head, neck and upper part of the chest; less commonly it is all over the body. It is often very profuse, so that the sweat stands in beads on the forehead, and the pillow is so thoroughly wetted that it has to be changed from time to time. It is seen most commonly when the child is sleeping, but it also occurs while he is awake, on slight exertion; it often causes sudamina and miliaria. The excessive perspiration may cause undue anxiety on the part of the mother, who is apt to infer from it the presence of "water in the head."

Another symptom which is often complained of—perhaps more in older infants—is great *restlessness* during sleep and a constant habit of throwing the bedclothes off. Even when the weather is cold the child will be found again and again with his bare legs and arms lying outside the blankets. At the same time he will roll his head from side to side on the pillow until the hair on the back of it becomes crumpled and thinned. Restlessness of this sort is not found only in rickety children, but it is more common in them than in others.

Another thing which the mother often notices is the

child's *disinclination to be moved.* His body and limbs seem tender, so that she can no longer use her accustomed freedom in washing and dressing him. He has to be very gently handled or he cries. Extreme tenderness, however, is probably never due to rickets alone. It may be a symptom of infantile scurvy or may be caused by a subperiosteal fracture or some other local injury.

The child shows a great disinclination to use his limbs. When he is left lying on the bed or sitting on the floor or on a chair, he keeps quite still, like an old man, and is not always on the move as a normal baby should be. When his feet are put to the ground he raises them up and cries instead of trying to stand like a healthy child; and, if a relapse of rickets occurs after he is walking, he at once "goes off his feet."

There is often also—especially in long standing cases—a history of *recurrent diarrhœa* with slimy and offensive motions alternating with constipation; or of attacks of *bronchitis* with each set of teeth or from slight exposure to cold. These are evidences of the unusual tendency to catarrh of the alimentary and respiratory mucous membranes which is characteristic of rickety children. There may also have been one or other of the *nervous complications*, which will afterwards be referred to.

In most cases, if the symptoms have lasted for any time, it will be noticed that the child is getting very soft and flabby, and he may also be losing flesh.

(*b*). **Physical Signs.**—One of the most striking points about the rickety child is that he is *flabby.* He may or may not be thin, often he is unusually fat; except in long-standing cases, he is not specially anæmic; but he is always more or

less soft and flabby, languid in his movements and easily tired.

No effect on the child's growth may be noticeable during the advancing stage of the disease, but, if the rickets is severe, and especially if it is so at an early period, there is always apt to be *stunting* of the figure.

The temperature is not raised. If fever is present, it is not the result of rickets, but indicates the presence of a complication.

The outline of the head is not altered in the early stages or in slight cases; but, when the disease is severe and lasts for any time, it generally assumes the characteristic *square shape* (Fig. 22, p. 59). The *fontanelle* is almost invariably *larger than normal* and its closure is delayed (p. 61), so that it may be found widely open at the end of the second or even the third or fourth year. Its margins also are abnormally thin and yielding. The coronal and other sutures often gape a little, and their margins are soft and pliant like those of the fontanelle. *Craniotabes* of this slight form, or of the more marked degree in which there are little separate soft spots on the parietal or other bones (p. 63), is very commonly found in rickets when the patients are between three and eleven months old, and it may occur earlier. After eleven months it becomes less common, but I have seen it well marked in one child aged twenty-two months. It is often the first unmistakable sign of rickets, as the beading of the ribs is sometimes difficult to make sure of in the earliest stages.

The *jaws* are sometimes considerably altered in shape (Fleischmann[1]). The upper is compressed in front into a

[1] *Klinik der Pädiatrik*, Bd. ii., Vienna, 1877.

sort of beak, while towards the back its alveolus turns somewhat outwards. The lower jaw becomes angular instead of rounded in outline, the front being flat and the angles situated about the canine teeth, and its alveolus tends to turn inwards. The result of this change in the form of the jaws and in the direction of the teeth is to interfere greatly with the proper apposition of the upper and lower sets of teeth.

Dentition is almost invariably *delayed* beyond the normal time; and the intervals between the appearance of the teeth vary greatly in duration. The teeth are also apt to come *in the wrong order* and to appear, one by one, instead of in pairs as is customary under normal conditions. It is a disputed point whether the teeth of rickety children are more than usually prone to decay. In severe cases of rickets, it is common for many of the front teeth to drop out without being carious, owing to alterations in the alveoli.



FIG. 46.—Rickets. Boy, aged 20 Months. Square Head; Beading of Ribs; Spinal Curvature.

The effect of rickets on the chest wall is seen in *beading of the ribs* and in the various degrees of *thoracic deformity* which have already been considered (p. 106), (Figs. 46 and 47). Rickety *curvature of the spine* and its diagnosis from Pott's disease have also already been referred to (p. 76). Curvature arises early in the disease and soon becomes severe if the child is allowed to sit up much.

The *abdomen* in rickety children is always *protuberant.*



FIG. 47 —Rickets. Girl, 2½ Years. Deformed Thorax, Large Abdomen, Slight Curvature of Arms, Laxity of Ligaments in Lower Extremity —the Feet being Turned Backward without the Child seeming to notice it.



This is owing partly to the special weakness of the muscular walls and partly to the recurrent dyspepsia and consequent accumulation of intestinal flatulence. It looks even larger than it is, from contrast with the narrowed chest.

Besides being displaced downwards, by the alteration in the form of the chest, the *liver* is sometimes enlarged.

The *spleen* is also larger than normal in a certain proportion of cases. Considerable enlargement of the spleen is almost always present in those cases of rickets in which there is much recent thickening of the cranial bones, and some enlargement is often found in cases where the general symptoms of the disease are rapidly progressing. Occasionally we meet with what is called rickety *pseudo-leucæmia*, in which there is great enlargement of this organ with marked anæmia but little or no increase in the number of leucocytes. In the great majority of rickety children, however, the spleen is not appreciably enlarged.

Owing to the abnormal tendency to catarrh of the mucous membranes which rickety children exhibit, we often find enlargement of the lymphatic glands in them, but this is not caused by the rickets directly.

The urine is practically normal. The results of the old analyses, according to which there was a large increase of lime salts in the urine of rickety children, have not been confirmed by recent observers.

The limbs exhibit marked changes in their bones muscles, and ligaments.

The changes in the bones consist of enlargement at the junction of the epiphyses and diaphyses, and bending, with occasional green-stick fractures, of the shafts. The *enlargement at the epiphyses* corresponds to the beading of the ribs,

and may often be seen commencing by the third or fourth month, although it does not attain any great size until the child is old enough to use the affected limb more actively than at that age. It is generally first and most clearly seen at the lower end of the radius. In the lower limb, the distal end of the tibia is the part where the first and greatest enlargement usually occurs. The legs are affected later than the arms, and the swellings do not usually attain a considerable size except in children who are trying to walk.

The *bending of the long bones* depends on the amount and direction of the pressure to which they are subjected. It does not occur to any extent in infants who are kept lying flat. Bending of the arms (Fig. 47) is commonly met with in severe cases and is secondary to kyphosis. The child tends to assume a frog-like position in which he tries to relieve his weak spine by bearing the weight of his head and shoulders as much as possible on his arms.

Outward bending of the legs (producing bow-legs) is commonly caused by the child standing and walking while the bones are too soft to support the weight of the body. Antero-posterior bending of the femora occurs in severe cases when children are carried much on the arm, or sit for long on a chair with the legs hanging down; and a similar backward bending of the tibia and fibula may occur if the child habitually sits with one leg laid over the other and the foot unsupported.

Fractures of any of the long bones may occur, and they are generally met with pretty late in the disease (Figs. 48 and 49). They are almost always green-stick fractures and, in some children, several are found; they may be produced by very little force. Complete fractures are extremely rare.



FIG. 48.—Rickets. Girl, aged 6 Years. Badly united Fractures of Clavicles, Right Humerus, and Left Radius and Ulna.



FIG. 49.—Rickets. Girl, aged 6 Years. Badly-united Fractures of Right Humerus, and of Ribs below Right Scapula.



Green-stick fractures of the ribs are caused, as already mentioned (p. 208), by lateral compression of the chest with the hands, in lifting the child those of the clavicle and humerus, by lifting him by the upper arms. The bones of the forearm are sometimes suddenly bent and fractured by a hasty parent seizing the child by the wrist. Under these circumstances, as the parent is usually right-handed, it is the child's left arm which is fractured (Fig. 45). Fractures are not common in the leg, but in the thigh they are often met with; they may be due to falls from a chair, or other slight nursery accidents. Often, when fracture occurs, nothing is noticed but local pain on movement or on pressure, and it is only when callus is thrown out that the injury to the bone is recognised.

Extreme *laxity and extensibility of the ligaments* is a marked feature in many cases of rickets and most characteristic of the disease. Their softness contributes largely towards the deformity in rickety spinal curvature and bending of the limbs; it often also leads to flat-foot and knock-knee. When it is present to a considerable degree, the limbs can be twisted about in a surprising way and the feet can be turned with the toes pointing directly backwards without inconveniencing the child (Fig. 47). When anti-rachitic treatment is successfully employed, this laxity of the ligaments rapidly diminishes.

Weakness of the muscles is as characteristic of rickets as bending of the bones. It may be severe in cases where the bones are but slightly affected. When this is so, the condition is sometimes spoken of as rickety pseudo-paralysis; and it is liable to be mistaken for infantile palsy, or even for early pseudo-hypertrophic paralysis.

Course and Duration.—The course pursued by a case of rickets varies considerably according to the age of the patient, his strength, his surroundings, and the treatment employed.

The bones most affected vary in different cases. This may be partly explained by the principle that rickets *tends to affect those bones which are in process of the most active development* (Baginsky [1]). Thus we find the cranium most severely affected in young infants, the thorax, vertebræ and arms in those a little older, and the lower limbs in those children in whom the process is latest of developing. As has already been pointed out, great deformities only occur when there is much movement of the bones affected or much pressure on them.

The duration of the disease also varies indefinitely. If promptly treated it may pass off in a few weeks. Often, treated or untreated, it lasts for months, and it may last for years. In estimating the duration of a case of rickets, however, we must distinguish clearly between actual presence of the disease and the signs of its former presence. The rickety patients seen in surgical wards are generally not suffering from rickets but merely from deformities resulting from it.

When rickets is really over we find that the active symptoms disappear, the child gets firm and energetic in his movements, the excessive perspiration ceases, and he sleeps quietly; the teeth begin to appear and the fontanelle closes; any nervous or catarrhal symptoms to which he has been liable cease to recur.

[1] *Practische Beiträge zur Kinderheilkunde. H.* ii. Rachitis. Tübingen, 1882.

Pathology.—The pathogenesis of rickets is still extremely obscure. The old theories, which attributed it to the want of lime and phosphorus in the food or to the decalcification of the bones by lactic acid circulating in the blood, have long been abandoned.

Kassowitz's[1] theory, according to which there is a *chronic inflammatory process in the bones* leading to absorption of their lime salts, seems to be disproved by Pommer's investigations.[2] According to Pommer, there is, in rickety bones, merely a *deficient deposition of lime salts* in the growing bone tissue. The fault, therefore, whatever it may be, lies not in the bones themselves but outside them, probably in the blood, which, for some unknown reason, fails to impart the lime salts which it contains to the bone cells. The signs of irritation seen at the ends of the long bones and elsewhere are simply the result of a normal degree of pressure, and other causes, on bones which are weak from a defective supply of lime.

Etiology.—The causation of rickets, like its pathology, is far from being thoroughly understood, but there are several factors which are known certainly to contribute towards it. The most important of these are ill-health of the parents, bad hygienic surroundings of the child, weakness of his digestion, and a defective diet.

Ill-health of the Parents.—It is very doubtful whether a father and mother who have suffered from rickets are more likely than other people to have rickety children. It is certain, however, that if a mother is feeble and anæmic

[1] *Die normale Ossification und die Erkrankungen des Knochensystems bei Rachitis und hereditärer Syphilis.* Th. ii. Wien, 1882.

[2] *Untersuchungen über Osteomalacie und Rachitis.* Leipzig, 1885.

during her pregnancy, her child is much more likely to become rickety than if she were strong at that time. It is also found that the youngest children in large families, who are born when the mother is middle-aged and less vigorous than formerly, are often rickety, when the older children brought up under similar treatment did not become so. There seems to be a special liability for twins to acquire rickets, probably owing to their being inadequately nourished in utero.

Congenital Syphilis.—Congenital syphilis was regarded by Parrot as an important cause of rickets. This is certainly a mistake. Severe syphilis, like any other exhausting disease, frequently predisposes children to become rickety, but it does not always do so. It is probable, however, that congenital syphilis modifies the manifestations of rickets to a certain extent. Thus rickety children who suffer also from syphilis seem more liable than others to marked cranial lesions.

Bad Hygienic Conditions.—The want of sunshine and fresh air is a very important cause of rickets. It is certain that many children, who spend most of the day in the open air, escape rickets entirely when their diet would certainly have caused it, had they been more confined to the house. Children who live in towns are in much greater danger of becoming rickety than those who live in the country.

In some large towns, it is observed that the proportion of rickety children brought for hospital treatment is much greater during winter and spring than in summer and autumn. This is supposed to be due to the extent to which town children are kept indoors during the colder months. In the out-patient department of the Sick

Children's Hospital in Edinburgh, the percentage of rickety cases is slightly diminished during a month or two in summer, if the weather is warm (probably because at that time a larger number of otherwise healthy babies are brought with diarrhœa); but, during the rest of the year, the proportion of rachitic to non-rachitic children scarcely varies at all.

Digestive Disturbances.—Prolonged gastric or intestinal disturbances are very apt to lead to rickets. They not only weaken the child's general condition, but, by preventing the absorption and assimilation of the necessary elements of the food, they have the same effect as improper feeding.

Improper Diet.—There can be no doubt that improper feeding is the most important element in the causation of rickets. We find it, or some digestive derangement which has the same effect, in all cases, while the other causes already mentioned are only sometimes met with. There seems to be a general agreement that the defect in the diet which is most likely to produce rickets is *the want of a proper proportion of animal fat. Deficiency of proteid material* is also important as a cause, and a lack of phosphate of lime may perhaps have a similar, although less marked, influence.

These conclusions have been arrived at after an investigation into the circumstances under which rickets most commonly appears. We find it, for example, very common in children who are being fed on either diluted cows' milk or condensed milk or any other form of food in which there is too little fat and proteid. It occurs in children on the breast if the mother has been nursing too long, so that her milk is poor in quality and deficient in one or both of these constituents. It is very frequently found in children at the

time of weaning, owing to their mothers giving them too much farinaceous food and too little milk. In such cases the excessive amount of farinaceous food is injurious, partly because it diminishes the child's appetite for other things, and partly because when given to any excess, it is apt to lead to indigestion.

Diagnosis.—Severe cases of rickets can scarcely be overlooked, and even slight cases are easy of recognition provided the symptoms are looked for. Frequently, however, the real cause of the weakness is overlooked and, in consequence, proper treatment is not applied. Rickets may always be suspected if a child is late of teething or of walking and if he has a history of recurrent bronchial or intestinal catarrh. Cases, in which the muscular weakness is great and the bone affection not marked, are sometimes mistaken for either infantile spinal, or pseudo-hypertrophic, paralysis. The main respect in which they resemble the latter disease is their peculiar waddling gait, and, particularly, the way in which they "climb up their legs" on rising from a sitting posture.

Prognosis.—If the unfavourable hygienic and dietetic conditions which are present can be got rid of, the rickety patient generally recovers rapidly. When the disease has not been severe or prolonged, all trace of it usually passes away as the child gets older, and, by eight or ten years old, even tolerably severe cases may show no symptom of their former affection.

Although rickets is not itself a fatal malady its presence constitutes a dangerous complication in cases of respiratory disease owing to the deformity of the chest walls and the weakness of the muscles which it causes.

"**Fœtal Rickets**" (**Achondroplasia**).—When the mother's



FIG. 50.—Achondroplasia. Boy, aged 5 Months.



health is bad during pregnancy, the infant may, at birth, show signs of rickets in the form of slight beading of the ribs, although this is very rare in this country. There is a disease which has been described as fœtal or intra-uterine rickets and has also sometimes been spoken of as fœtal cretinism. It is now believed to have no real connection with rickets. The condition, which is perhaps best called *achondroplasia* (Parrot), is a fœtal disease in which there is "an absence, arrest or perversion of the normal process of endochondral ossification of the most definite and universal character in every element of the skeleton in which the process normally takes place in intra-uterine life." [1] Children affected by it are therefore born with a peculiar deformity (Figs. 38, 39 and 50), which remains during life and to some particulars of which we have already alluded (p. 168). Their heads are relatively rather large, their bodies narrow about the chest although otherwise tolerably normal, their extremities are abnormally short—often only half the proper length. The great majority of these children are, for some unexplained reason, premature and still-born, or they die within a few days of birth. In those who survive there is often a tendency to rickets in early childhood, but this is not the cause of the characteristic deformity which is the result of a disease which has run its course before birth.

"**Late Rickets.**"—Occasionally after some weakening disease such as influenza, measles or whooping-cough, a child of three or four years will begin to show marked signs of rickets for the first time; and a few cases beginning at

[1] Symington and Alexis Thomson, *Lab. Rep. Roy. Coll. Phys. Edin.*, Vol. iv., 1892, p. 238.

nine, eleven, thirteen or even seventeen[1] have been put on record. These cases are spoken of as "late rickets" or "rachitis tarda." It is now generally thought that they are due to a recrudescence of rickets which had previously been present.

"**Acute Rickets.**"—A number of cases have been described as acute rickets. These are now held to have been mostly instances of infantile scurvy. Occasionally the symptoms of a case of simple rickets set in comparatively rapidly; and, as a rule, if the onset is acute, the case is not an uncomplicated one.

Treatment.—The most important part of the treatment of rickets consists in the *regulation of the diet*, and the *improvement of the hygienic conditions*. The amount of the meals and the intervals between them must be attended to, and they must contain a sufficient amount of easily digestible fat and albuminoid.

In many cases the state of the digestion is such as to prevent absorption of the proper elements of the food, and the *stomach and bowels have then to be attended* to before a satisfactory diet can be digested.

Fresh air and *sunshine* are always to be recommended, but when the child is taken out, he must be warmly and uniformly clad, and precautions must be taken against his catching cold. Sea air is found to be particularly beneficial. The careful application of the *cold douche* and of *massage* is always useful when the child is beginning to recover, and is of especial value in cases where muscular debility forms a prominent symptom.

[1] See case published by Dr Alex. James, *Scot. Med. and Surg. Journal*, Jan. 1897.



The *medicinal treatment* of rickets consists, chiefly, in the administration of cod liver oil, which provides the most thoroughly digestible form of fat. If cod liver oil disagrees with the child, a simple alkaline tonic may be tried first for a short time. Iron is useful if the digestion is good, but otherwise it is apt to disagree.

The administration of phosphorus has been strongly recommended by Jacobi and Kassowitz, and, in many cases, is very useful. It may be given alone, but it is generally best dissolved in cod liver oil; $\frac{1}{200}$ to $\frac{1}{100}$ of a gr. may be administered two or three times a day (F. 23 to 25).

The excessive perspiration may sometimes be lessened by giving oxide of zinc in doses of one or two grains at bedtime, or several times a day. The general restlessness and sleeplessness may be treated by antipyrin or bromide.

In addition to prescribing the diet and medicine, it is important, if possible, to *prevent those actions and postures* which predispose to the occurrence of bony deformities. The child should not be carried always on the same arm (so as to avoid the formation of a lateral curvature of the spine), nor should he be allowed to remain long in the sitting posture when there is a tendency to kyphosis. Under these circumstances, he should be encouraged to lie flat as much as possible. He must also be prevented from assuming habitually any attitude which throws undue weight on any of the bones, and kept from walking until the active symptoms of rickets pass off. For this purpose light padded wooden splints should be applied to the outer surface of both lower limbs, reaching from the pelvis to about four inches below the sole, so as to make walking

impossible. Splints which are applied in such a way as to allow the children to walk while wearing them are of no use whatever.

Children with rickety deformities of the thorax are greatly benefited by dumb-bell and other arm exercises.

NERVOUS COMPLICATIONS OF RICKETS.

There are four more or less common nervous symptoms which are regarded by many as manifestations of rickets, *viz.*, facial irritability, laryngismus, tetany and idiopathic convulsions; and two others—head jerking and nystagmus —which are less generally regarded in a similar way. The precise connection of these conditions with rickets is not easy to define and some authorities altogether deny it.

There is no doubt that any of them may be met with apart from rickets, but it is equally certain that, when they occur in children between six months and three years old, undoubted rickety changes are almost invariably discoverable, although often not severe in degree. While, therefore, we admit that the exact degree to which rickets acts in their causation is as yet undefined, it seems justifiable as well as convenient, in the meantime, to describe them as nervous complications of that disease.

(*a*) **Facial Irritability or Chvostek's Symptom.**—This is the commonest and least important of these nervous manifestations. It is due to an abnormal mechanical irritability of the facial nerve, and consists in a momentary contraction of the muscles supplied by this nerve when a sharp tap is given to the cheek below the malar eminence. The contractions resemble those caused by the sudden passage of a galvanic current. It is sometimes more

marked on one side of the face than on the other; and, in some cases, it is more noticeable in the upper, in others in the lower half of the face. A similar contraction of the inner end of the eyebrow may often be caused by tapping on the temple.

Facial irritability is not uncommon in older children, and it occurs in them not only with tetany, and certain other nervous conditions, but with slight dyspeptic disorders and sometimes apart from any ascertainable disease. In young children it is common, but it is rarely, if ever, found before the sixth month. It occurs in most cases of tetany and laryngismus. When met with alone, in children under three years old who have any sign of rickets, it may, practically always, be regarded as a danger signal showing a state of abnormal nervous excitability and a probable tendency to more serious neuroses. Under these circumstances, therefore, it must be taken as an indication for prompt sedative, tonic, and especially anti-rachitic treatment.

(*b*) **Laryngismus Stridulus.**—This is a spasmodic affection of the larynx causing a sudden arrest of breathing for a few seconds with the chest in the position of expiration, followed by a crowing inspiration. In some cases, which are in other respects analogous to those of ordinary laryngismus, the arrest of the breathing occurs when the chest is full of air so that the momentary arrest of respiration is not succeeded by a crow. This condition may be called *expiratory apnœa* (Kassowitz[1]). Laryngismus is very rare before six months and after three years old.

Although the arrest of the breathing only lasts a few

[1] *Vorlesungen über Kinderkrankheiten im Alter der Zahnung.* Wien. 1892, G. 168.

seconds, the child may get considerably cyanosed; his hands are clenched, his limbs become stiff and a convulsion may occur. The attacks are apt to be brought on by fright or annoyance or by a sudden movement or exposure to cold; they are sometimes set up while the child is swallowing, and often take place when he awakes from sleep. The question whether the attack wakens the child or only occurs after he awakes, is still matter of discussion. In the great majority of cases, laryngismus is recovered from, but the prognosis must be guarded as there is always a possibility of the spasm being prolonged and the child dying in it from asphyxia. When laryngismus sets in for the first time during the onset of an acute disease, it generally indicates a dangerous degree of weakness.

Laryngismus occasionally occurs as a symptom of hydrocephalus and other diseases, but in the great majority of cases it is met with in rickety children and has the same significance as to treatment as facial irritability, tetany and fits.

(*c*) **Tetany.**—This consists in a peculiar tonic spasm of certain muscles of the extremities, causing the hands and feet to assume characteristic postures.

In most cases there is slight flexion of the wrist with spasm of the interossei which causes the so-called "accoucheur's hand" (Fig. 51). The fingers are somewhat flexed at the metacarpo-phalangeal and fully extended at the inter-phalangeal joints. They sometimes overlap one another and the thumb crosses the palm so that its tip touches the middle phalanx of the ring finger. In some cases, chiefly in younger children, the fingers are simply flexed to an extreme degree into the palm, and the thumb



FIG. 51.—Tetany. Girl, aged 13 Months.



FIG. 52.—Tetany. Boy, aged 7 Months.





is either doubled under them or projects between two of the proximal phalanges. Various transitional postures of the hand may be met with, such as are seen in Fig. 52.

The lower limbs are usually affected along with, but sometimes without, the upper. The front part of the foot becomes contracted so as to cause an antero-posterior furrow on the sole, and there is extreme flexion of the toes. In rare cases, the muscles of the back are affected, causing slight head retraction.

The muscular contractions vary in severity from time to time, and in severe cases present regular spasms. During these there is often some redness, tenderness and swelling of the dorsum of the hand or of the instep, so that cases have been mistaken for rheumatism. During the intervals between these spasms, they can often be brought on again by compression of the main artery or nerve of the limb (Trousseau's symptom). The contraction affects both sides of the body at once, but sometimes one side more severely than the other. There is, almost always, a history of an attack of diarrhœa preceding the onset of the tetany. The contraction generally passes off in a few days, but, in severe cases, it may last for weeks or even months.

Slight attacks of tetany, occurring in young children, have often been spoken of as "carpo-pedal contractions," and several authorities have been strongly of opinion that these cases should not be called tetany. While it is certain, however, that the tetany of older children and adults has different elements in its causation from that of infants, the symptoms are so similar in the two sets of cases, and there are so many transitional cases, that it seems unreasonable to designate them by different names.

(*d*) **Convulsions.**—The influence of rickets as a cause of fits has been already dealt with (p. 134). When convulsions occur in children between six months and two years old, in whom there is no reason to suspect organic brain disease and in whom there is no elevation of temperature, they are, in the great majority of cases, due to rickets and, consequently, amenable to anti-rachitic treatment.

Of these four nervous symptoms, facial irritability and convulsions are very common, laryngismus rather less so, and tetany comparatively rare. They may all be present at once, any three or two may be found together, or any one of them may occur alone. Convulsions and facial irritability are frequently met with alone, apart from the others, laryngismus less commonly, and tetany very rarely so. There are several clinical features which are common to all of these neuroses, whether single or in combination.

1. They occur mainly between the ages of six months and three years.

2. They are all much more frequently met with in the earlier than in the later months of the year. This is probably owing to the cold winds which prevail in these months predisposing to their occurrence.

3. They occur mostly in children with slight but progressive rickets, and less in cases with advanced rickety changes.

4. Sources of reflex irritation, such as teething, constipation, diarrhœa or acid dyspepsia, are very commonly found, and are probably important as secondary exciting causes of the nervous phenomena.

5. The most important treatment in all cases is that



directed against the rickets, but cold douching, sedatives, and antacids are also very important as auxiliary measures.

(*e*) **Head Jerking, or Head Nodding, and Nystagmus.**[1]— These two symptoms are almost always found together, but occasionally the head nodding commences before the eye movements, and the nystagmus may exist alone for months before the head movements begin.

The movements of the head may consist of simple forward nodding, but in most cases there is more lateral jerking or rotatory movement with only occasional nodding. The jerking ceases when the infant is lying down, or is asleep, and it becomes more marked when his attention is directed to any object.

The nystagmus is rapid and of short range. It is most frequently horizontal, but may be rotatory or vertical; in the latter case the upper eyelid may participate in the movement. The nystagmus is frequently confined to one eye, and is generally more marked on one side than on the other. Sometimes there is rotatory or vertical nystagmus of one eye and distinctly horizontal movements of the other. The ocular movements are usually increased in extent if the head is held steady.

Occasionally, convergent strabismus occurs and in some cases there is rhythmical contraction and dilatation of the pupils (hippus). The child has often a peculiar way of fixing his head and looking at things side-ways; and in many cases short passing attacks of unconsciousness are noticed, in which the child stares vacantly in one direction

[1] See Hadden. *Lancet*, June 14th, 21st and 28th, 1890; and *St Thomas' Hosp. Rep.*, Vol. xx.

for a short time. Head jerking and nystagmus may begin as early as the second month of life, but they are more frequently observed for the first time during the second half of the first year. They may pass off in a few weeks, but generally they last for several months. They always end in recovery, but the strabismus which occasionally occurs along with them may remain permanently.

These symptoms resemble the four previously considered, in the age at which they usually occur, the time of year during which they are most frequently met with, and the fact that they mostly occur in children with slight rickets. They do not usually, however, present any marked source of local irritation, nor do they respond to anti-rachitic treatment in the very rapid and striking way in which cases of laryngismus or convulsions in rickety children usually do. It is comparatively rare to find them along with facial irritability, laryngismus, tetany, or convulsions.

Prognosis.—Cases of laryngismus and convulsions, in rickety children, generally improve rapidly or disappear altogether under treatment. The prognosis must, however, be guarded if laryngeal spasm is present, because it is occasionally fatal. In cases of tetany the prognosis is also good. Slight cases usually recover rapidly, but severe cases are often very obstinate and are apt to recur. Nystagmus and head jerking usually last for several months, the head jerking generally ceasing before the nystagmus.

Treatment.—In all cases, suitable alteration of the *diet* is to be ordered along with the administration of *cod liver oil*. *Phosphorus* and *sedatives* may also be given with advantage.

In laryngismus and in convulsions, the regular employment of *cold douching* has generally a remarkably rapid



effect in diminishing the frequency of the attacks, or stopping them altogether. The douche should be given in the morning in front of a fire. The child should be taken from bed and placed in a bath with about one inch of hot water. A jug of cold water (60° to 65°) should then be poured over his shoulders, and he should at once be taken out of the water and rubbed with a towel till he is dry and warm. In some cases, the douching frightens the child very much, but, even when this is the case, it may be very successful in stopping the attacks. If the attacks are numerous or severe, it is well to give a *sedative* also. Bromide or chloral may be used, but antipyrin is generally more reliable in its action. During the attacks of laryngismus, the inhalation of ordinary *smelling salts* is sometimes useful in arresting a spasm.

In tetany, the use of *antacid remedies* is generally advisable in addition to those given for the rickety condition, and when the spasmodic contraction of the extremities is so severe as to cause pain, chloral or some other *sedative* may be given. The administration of thyroid substance has, in my experience, no effect at all on the tetany of rickety children.

Head jerking and nystagmus generally improve steadily under anti-rachitic and tonic treatment. If the movements are very marked, *antipyrin* may be given ; it seems usually to diminish them to some extent.

INFANTILE SCURVY.

Scurvy is not a common disease in infancy, but it is a very important one, because it is so readily amenable to proper treatment, and, when untreated, so apt to end fatally.

Definition.—"Infantile scurvy is an affection characterised by marked anæmia and severe pains referred to the bones. Anatomically, its essential characteristic is the presence of sub-periosteal hæmorrhages situated mainly round the bones of the lower limbs. During the period before dentition, the hæmorrhages may be confined to the sub-periosteal regions, but after the eruption of the teeth, we meet, as in the scurvy of adults, with ecchymoses of the gums; these, however, are generally less important. That which distinguishes infantile scurvy from other forms of anæmia is its immediate arrest under the influence of fresh milk and the juice of vegetables and fresh fruit" (Barlow [1]).

As in the case of rickets, the affection of the bones constitutes the most characteristic lesion in this disease; but the less striking manifestations (anæmia, slight hæmorrhages, pains, &c.) which precede the sub-periosteal hæmorrhages are of great importance in indicating its presence during the early stages.

Dr Cheadle was the first to draw attention (in 1878 [2]) to the real nature of cases of infantile scurvy, and in 1883 Dr Barlow [3] confirmed his opinion in a very thorough paper in which he gave an account of several post-mortem examinations, and proved that these cases were due to a combination of rickets and scurvy; scurvy being the essential, and rickets a variable element. On the Continent, infantile scurvy is generally spoken of as "Barlow's Disease."

[1] Art. "Scorbut Infantile." *Grancher's Traité des Maladies de l'Enfance*, t. ii., p. 173.

[2] *Lancet*, November 16th, 1878.

[3] *Trans. Roy. Med. and Chirurg. Soc. London*, 1883.



Clinical Features.—Infantile scurvy is most frequently seen in children between eight and fourteen months, but it may occur as early as four months, or as late as two years old.

Owing to the very important part played in its causation by proprietary articles of food, it is rarely met with among the very poor, and is chiefly seen among the middle and upper classes. For the same reason, it is mainly a disease of large towns, and is found chiefly where hand feeding is frequent and fresh milk difficult to obtain. Among the infants attending the Dispensary of the Sick Children's Hospital in Edinburgh, about 71 per cent. are breast fed, more than 21 per cent. are fed on diluted fresh cows' milk, and less than 7 per cent. on proprietary foods, generally prepared with fresh milk. Among them, consequently, scurvy is extremely rare.

Symptoms.—The most characteristic symptoms of infantile scurvy, being due to hæmorrhage, generally come on suddenly. They do not, however, set in, in the midst of perfect health. Their appearance is preceded for some weeks by a cachectic condition, which is characterised by gradually increasing *listlessness and debility*, with disinclination for movement. The child is anæmic, and in severe cases has a peculiar *sallow earth-coloured tint*; he is short of breath on exertion, refuses his food, and is very *irritable.* At this time also there may be *tenderness on movement* and pressure, especially of the lower limbs—more than would be accounted for by the rickets, which is almost invariably also present.

If no change is made on the child's diet and surroundings, *pseudo-paralysis* of one of the lower limbs will probably

develop more or less suddenly. The infant ceases to move the affected limb, and screams if it is touched. There is some swelling over the epiphysial region of one of the bones, usually the femur, accompanied by extreme tenderness, and the skin is tense and shiny. The joints are unaffected, and there is no local or general rise of temperature. This condition is due to the occurrence of a *sub-periosteal hæmorrhage*. In severe cases, there may also be crepitus, owing to *separation of the epiphysis*, or, very rarely, to *fracture* of the shaft. Less commonly, the sub-periosteal hæmorrhage takes place in the upper limb, on the pelvis or scapula, or on one or more ribs. Rarely, it occurs *under the dura mater* or *inside the orbit*, and, in this situation, it causes a marked *protrusion of the eye*. In addition to the sub-periosteal hæmorrhages, there may be effusion of blood and serum *among the muscles*. The affection of the limbs tends to be symmetrical, that of one side following shortly after that of the other.

Along with the sub-periosteal hæmorrhages, and often before them, *cutaneous ecchymoses* occur. These often have the appearance of ordinary bruises, and they are very readily produced. One situation where they are early met with is over the lower margin of the orbit, where they are probably caused by the ordinary process of washing and drying the child's face. Sometimes there are ecchymoses in the conjunctiva, and there may be *œdema of the eye-lids*, especially the upper, on one or both sides.

The gums are usually pale at first. On close examination, however, small sub-mucous hæmorrhages may often be found on them, and later they tend to become spongy, swollen, and ulcerated. The degree of *sponginess of the*

gums varies with the number of teeth that have appeared. If there are no teeth, or only one or two, there is usually no sponginess. If there are many, it is generally very marked.

Occasionally, *epistaxis* occurs, and sometimes a little blood is passed from the *bowel*. The *urine* often contains blood, sometimes in large quantity, and, in rare cases, hæmaturia may be the only striking symptom of the disease present. The blood in the urine apparently comes from the kidneys, as, where the hæmorrhage is profuse, quantities of blood casts are found. *Pyelitis* occurs, rarely, in scorbutic children, and when pyuria is discovered, in infancy, an investigation into the possible presence of scurvy should always be made.

When scurvy occurs in children more than two years old, the symptoms resemble those in adults; sub-periosteal hæmorrhages are much less likely to occur, and the spongy condition of the gums is a more prominent symptom.

Etiology.—Scurvy is caused in children, as in adults, by a diet deficient in the anti-scorbutic element, whatever that may be. There are also, however, important predisposing causes which weaken the child's health and render him liable to take the disease; for there can be no doubt that many children, who are fed on a diet which produces scurvy in others, develop no symptoms of the disease.

In young infants, the commonest cause is the use of *condensed milk*, or of one of the *proprietary foods*, and *peptonised milk* has sometimes the same effect. When fresh cow's milk is just raised to boiling point, or is pasteurised, it does not appear to lose its anti-scorbutic properties to any great extent; but, when it is exposed to

a temperature of 212° F. for twenty minutes or more, it may be affected in this way, and a number of cases have been put on record in which the continued use of cow's *milk sterilised by prolonged boiling* has resulted in scurvy. Scurvy practically never occurs in infants who are on the breast, except in cases where the mother is herself suffering from the disease.

In older children, scurvy is met with occasionally, and is especially apt to occur towards the end of prolonged cases of chronic diarrhœa. In these, sterilised milk is often given all through, and vegetables, including potatoes, are stopped, so that the diet becomes very defective in anti-scorbutic properties.

Diagnosis.—A well-marked case of infantile scurvy is not difficult to recognise, but in slight atypical cases, especially where the patient is also suffering from another disease, the diagnosis may present considerable difficulty.

The character of the diet must always be carefully investigated. If it has contained abundant fresh material and raw milk, there is no probability that the case is one of scurvy, although the other symptoms may be suggestive of that disease. The general condition of the patient should also be carefully noted. In all cases of scurvy, there is distinct cachexia and debility. Marked tenderness of the lower limbs, without any obvious cause, should always arouse a suspicion of scurvy, and, if blood corpuscles are found on microscopic examination of the urine, this is strongly in favour of the scorbutic nature of the case. The most important diagnostic, however, is the rapid and permanent improvement which occurs under anti-scorbutic treatment.

Treatment.—The treatment consists in substituting for the child's defective diet one which contains as large a proportion as possible of the anti-scorbutic element, and which is suitable to his age.

For young infants, the *milk of a suitable wet nurse* forms the best diet. For most cases, however, *properly prepared cows' milk* does very well, and, especially for obstinate or severe cases, it should not be sterilised. All tinned foods must, of course, be stopped.

Orange juice should be given in doses of one or two teaspoonfuls twice daily, and, if this cannot be obtained, lemon or grape juice may be substituted for it. *Potato pulp* is strongly anti-scorbutic, and may be given in milk to infants of nine months and upwards. *Raw meat juice* is also useful, but it is not nearly so strongly anti-scorbutic as fruit juice and potato. In older children, *sieved vegetables* are to be given.

The result of such anti-scorbutic diet is exceedingly striking, and the improvement is marked within a day or two of its commencement. The appetite and vigour return, the hæmorrhages cease, and the effused blood is rapidly absorbed; the gums assume their normal appearance; within a few weeks, in simple cases, the child is generally well. In some children with defective digestion, the symptoms tend to recur, and the diet requires to be carefully regulated for a long time.

In addition to the alteration of the diet, *tonics*, especially cod liver oil and iron, may sometimes be given with advantage, although they are often not necessary; the hygienic conditions must be attended to.



APPENDIX A.

THE following facts are abstracted from the "Report of a Committee appointed by the Clinical Society of London to investigate the periods of Incubation and Contagiousness of certain Infectious Diseases" (Longmans, Green & Co.), London, 1892.

Diphtheria.

Incubation Period.—This generally lasts two days, seldom exceeds four days, probably never longer than seven days.

Infective Period.—The patient is infectious (*a*) in the incubative stage; (*b*) during the developed attack; (*c*) for a varying and uncertain period after apparent recovery.

Persistence of Infection.—The infection can be retained in clothes, carpets, and other fomites for months, perhaps years.

Enteric Fever.

Incubation Period.—Its duration varies very much. Generally lasts from twelve to fourteen days; may be only eight or ten days, or possibly even less; in rare cases, fifteen, eighteen, or twenty-three days.

Infective Period.—This lasts from the onset of the first symptoms until convalescence has been established for at least a fortnight.

Persistence of Infection.—Fomites retain the infection for two months at least.

Influenza.

Incubation Period.—This usually lasts three or four days, but varies from a few hours to five days in duration.

Infective Period.—The patient may convey infection during the whole course of the illness, *i.e.* for a week or ten days.

Measles.

Incubation Period.—This usually lasts for nine or ten days; rarely only for four or five, or for as long as fourteen days. Generally the rash appears on the fourteenth day from the exposure to infection.

Infective Period.—Measles is very infectious during the primary period, and probably not less so during the whole acute attack. The infection may last for almost three weeks from the beginning of the rash.

Persistence of Infection.—Fomites are probably capable of retaining the infection for a short time.

Mumps.

Incubation Period.—The interval between the exposure to infection and the commencement of parotitis is generally three weeks, a day more, or a day or two less. It is occasionally as long as twenty-five days, or, more rarely, as short as fourteen days. The beginning of the prodromal stage is so difficult to ascertain, and so uncertain in duration, that the commencement of the illness is usually dated from the appearance of the parotitis.

Infective Period.—This begins with the beginning of the prodromal stage, which may last four days; is very active at the time of onset of the parotitis; diminishes progressively from that time, and ceases probably within a fortnight and certainly within three weeks of that date.

Rubeola ("German Measles").

Incubation Period.—This lasts for eighteen days, usually, but may be as long as twenty-one, or rarely as short as five or six days.

Infective Period.—The patient is infectious for two or three days before the rash appears and when it is out. The infection is probably over in a week in mild cases, and by the time desquamation is over, in the more severe.

Scarlet Fever.

Incubation Period.—This usually lasts for more than twenty-four, and less than seventy-two, hours. It is occasionally less than a day, and sometimes longer than three days; it probably never exceeds seven days.

Infective Period.—It is infectious from the onset of the earliest symptoms, and remains so until desquamation is completed, sometimes for as long as eight weeks.

Persistence of Infection.—The infection is readily preserved in, and conveyed by, fomites.

Small-pox.

Incubation Period.—This is commonly twelve days, but is not very infrequently a day more, or less. It is occasionally only nine or ten days, and sometimes fourteen or perhaps fifteen days.

Infective Period.—The patient is infectious from the onset of the first symptoms until all scabs have cleared off, and most infectious during the height of the active stage of the disease.

Persistence of Infection.—Fomites readily carry and retain the infection.

Varicella.

Incubation Period.—This lasts generally for fourteen days, but may be a day less or four or five days more.

Infective Period.—The infection may be derived from a patient at least as soon as the rash appears. A convalescent patient may convey the infection to others. The infection may probably be conveyed in clothes.

APPENDIX B.

DIRECTIONS TO MOTHERS RESPECTING CHILDREN WITH PARALYSED LOWER LIMBS.[1]

CLOTHING.

The limb must be kept warm day and night. During the day the child should be provided with specially thick woollen stockings reaching well above the knees; and, if the limb gets cold at night, he should wear a padded overall.

RUBBING.

The limb should be rubbed for at least a quarter of an hour twice daily. Let the child lie on a bed while his leg is being rubbed.

(1) Rub the paralysed leg from the foot right up to the top of the thigh. Whilst rubbing with the right hand hold the child's foot with your left. Commence by putting the broad part of your hand on the calf of the child's leg. In rubbing the child's thigh, put your hand first

[1] These Directions have been slightly modified by Dr J. H. A. Laing from those formerly in use at the Hospital for Sick Children, Great Ormond Street, London.

on the back of the limb and afterwards on the front of it. Rub strongly over the soft parts and gently over the bones. Rub upwards only.

(2) Knead the whole limb carefully from the toes upwards, using the whole of both hands round the limb and *not* the points of the fingers. Work slowly, pressing deeply, but never so as to hurt. When the front has been finished turn the child on his face and work up over the back and hips. Go well up to the bottom of the back.

(3) Make the child practise trying to move all parts of the limb in all directions, helping him when necessary. It is *very important* to encourage the child to try to move the weak limb; the more he does so the better.

(4) Strike the limb all over gently with the loose fingers for two or three minutes.

(5) Finish up by rubbing the whole limb gently. This gentle rubbing is very soothing after the harder and deeper kneading.

BATHS.

Once a day, let a large jugful of hot water containing two handfuls of salt be poured down the leg and thigh. Then pour about half the quantity of cold water over the leg and thigh. And, lastly, rub thoroughly dry with a towel, and continue to rub until the limb is perfectly warm.

APPENDIX C.

FORMULÆ.

F. 1, p. 35.

Heavy Carbonate of Magnesia,	3 ounces
Powder of Florentine Iris,	1 ounce
Otto of Roses,	3 drops

Tooth Powder.

F. 2, p. 35.

Precipitated Chalk,	2 ounces
Light Magnesia,	2 ounces
Oil of Cinnamon,	8 drops
Thymol Crystals,	4 grains
Otto of Roses,	10 drops

Tooth Powder.

F. 3, p. 118.

Oil of Amber,	4 drachms
Oil of Cloves,	4 drachms
Olive Oil, up to	2 ounces

F. 4, p. 118.

Ipecacuanha Wine,	5 minims
Spirit of Nitrous Ether,	5 minims



Solution of Acetate of Ammonia,	30 minims
Cinnamon Water, up to	1 drachm

F. 5, p. 118.

Carbonate of Ammonia,	1 grain
Ipecacuanha Wine,	5 minims
Syrup of Tolu,	30 minims
Cinnamon Water, up to	1 drachm

F. 6, p. 118.

Camphorated Tincture of Opium,	3½ minims
Ipecacuanha Wine,	5 minims
Syrup of Squills,	30 minims
Infusion of Serpentary, up to	1 drachm

F. 7, p. 121.

Oil of Turpentine,	1 drachm
Compound Camphor Liniment, up to	2 ounces

F. 8, p. 182.

Tannic Acid,	30 grains
Carbolic Acid,	30 grains
Glycerine, up to	1 ounce

F. 9, p. 182.

Iodine,	6 grains
Iodide of Potassium,	12 grains
Peppermint Oil,	4 minims
Glycerine, up to	1 ounce

F. 10, p. 222.

Oxide of Zinc, Boric Acid, Starch Powder,	equal parts

F. 11, p. 235.

Tincture of Calumba,	5 minims
Cod Liver Oil,	30 minims
Lime Water,	30 minims

F. 12, p. 235.

Cod Liver Oil,	18 minims
Syrup of the Lactophosphate of Lime,	18 minims
Lime Water,	18 minims
Hypophosphite of Sodium,	1 grain
Mucilage of Gum Acacia,	5 minims
Oil of Cassia,	⅛ minim

F. 13, p. 236.

Sulphate of Magnesium,	2½ grains
Dilute Sulphuric Acid,	1 minim
Sulphate of Iron,	¼ grain
Syrup of Ginger,	2 minims
Peppermint Water, up to	1 drachm

F. 14, p. 236.

Bicarbonate of Sodium,	3 grains
Tincture of Nux Vomica,	1 minim
Compound Infusion of Gentian, up to	1 drachm

F. 15, p. 242.

Butyl Chloral Hydrate,	1 grain
Glycerine,	10 minims
Peppermint Water, up to	1 drachm

F. 16, p. 242.

Bicarbonate of Sodium,	3 grains
Aromatic Spirit of Ammonia,	1 minim

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APPENDIX D.

RECIPES.

Arrowroot Water.—Rub up a teaspoonful of arrowroot with a tablespoonful of cold water until smooth; pour on it, while stirring, a pint of boiling water, and boil for five minutes.

Barley Jelly.—Put two tablespoonfuls of *washed* pearl barley into a pint and a half of water, and slowly boil down to a pint; next strain out the barley, and let the liquid settle into a jelly. Two teaspoonfuls of this, dissolved in eight fluid ounces of warmed and sweetened milk, are enough for a single feeding.

Barley Water.—Put two teaspoonfuls of *washed* pearl barley into a pint of cold water, boil down to two-thirds of a pint, and strain through muslin. It should be made twice a day, as it will not keep.

Beef Tea.—Mince one pound of lean beef, and add to it one pint of pure cold water and ten drops of dilute hydrochloric acid, let it stand for two or three hours, with occasional stirring, and then simmer, for ten to twenty minutes.

Brandy and Egg Mixture.—Rub up the yolks of two eggs with a tablespoonful of white sugar, and add four tablespoonfuls of brandy, and eight of cinnamon water. Dose, one teaspoonful to one tablespoonful.

Bread Jelly.—Take four ounces of stale crumb of bread and break it into small pieces; cover with boiling water and let it stand for six hours. Squeeze out the water and add fresh water to the pulp. Boil for an hour and a half; squeeze out the water and pass the pulp through a fine hair sieve. On cooling, a jelly is formed. It may be given with sweetened milk, in the proportion of a tablespoonful to eight ounces. It must be prepared fresh twice daily, as it will not keep.

Malt Infusion.—Mix three full tablespoonfuls of crushed malt thoroughly with half a pint of cold water in a jug. Allow the mixture to stand over night—ten or twelve hours. Decant off the supernatant liquid carefully from the sediment, and strain it through two or three folds of muslin, until it comes through fairly clear and bright. This should make about six ounces of malt infusion. It should be kept in a well corked bottle, and a few drops of chloroform are to be added to it to preserve it. A dessertspoonful may be mixed with the food before it is taken, or be sipped along with it.

Oatmeal Water.—Take one tablespoonful of coarsely ground oat-

meat: add a pint of water, and simmer gently for an hour; strain, and add sufficient water to replace that which has evaporated.

Raw Meat Juice.—Mince finely the best rump steak; add cold water in the proportion of one part of water to four of meat. Stir well together, and allow to soak for half an hour, cold. Forcibly express the juice through muslin by twisting it.

Sherry Whey.—To half a pint of milk, whilst boiling in a saucepan, add one wine-glassful of sherry, and afterwards strain; sweeten with pounded sugar to taste.

Veal Tea.—Take a pound of minced veal, free from fat; mix with a pint and a half of water or barley water; heat in a slow oven for three hours; strain and skim.

White of Egg Water.—Take the white of a fresh egg; cut it in various directions with a clean pair of scissors. Shake it in a bottle with a pinch of salt and half a pint of cold water. Strain through muslin.

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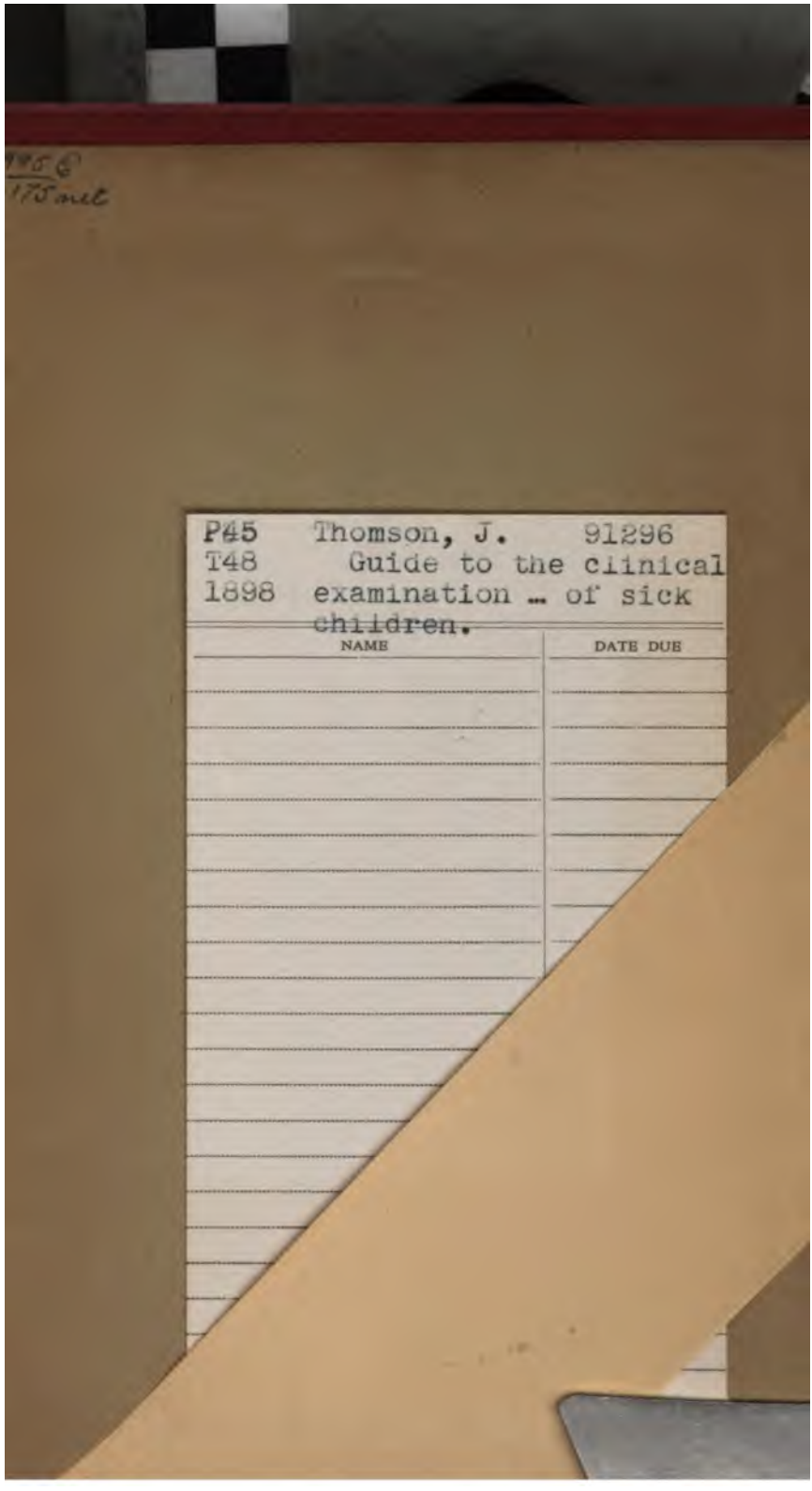






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